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# Telephone Engineer

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JANUARY 1928

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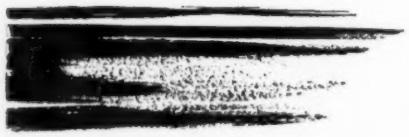

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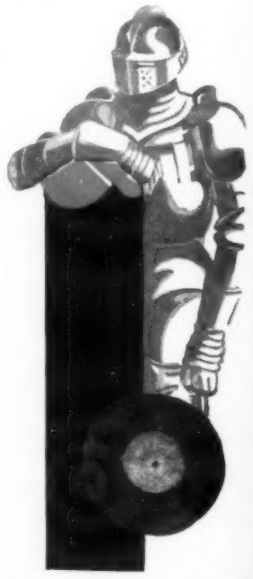

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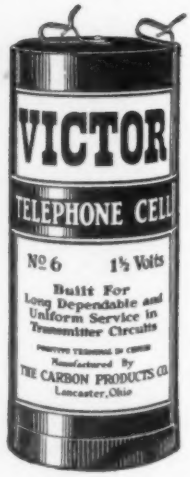


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# Telephone Engineer

Volume 32 JANUARY, 1928 No. 1

## Utilities' Tax Burden Needs Constant Watch

That the mounting burden of taxation is becoming a matter of real concern to telephone companies is evident to anyone who studies the question even casually. The investigation made by Professor Herbert B. Dorau and his associates at Northwestern University, presented in part at the convention of the United States Independent Telephone Association in 1926 and continued since that time, remove all doubt of the fact that taxes consume a greater and greater portion of the dollar of telephone revenue.

The trend has been definitely upward since 1916 until in 1925 7.56 cents of every dollar of telephone operating revenue went for taxes. Class A, B and C companies all suffered about in the same proportion from the increase and no district in the country has escaped an increase of about the same proportion. The comparison between taxes and operating income before taxes in the years covered, 1916 to 1925 shows that taxes consumed approximately 17.5% of operating income in 1916 and reached a peak of 32.6% in 1920. The ratio then receded to 26.48% in 1925. The significance of this recession is that telephone companies have succeeded in reducing the ratio of telephone operating expense to telephone operating revenue and so have compensated in part for the increase in taxes.

There has been much loose talk, if not loose thinking, about the effect of taxes upon regulated public utilities. We once heard a public service commissioner of a state of some note for high utility taxes say to an assembly of utility men, "You are not tax payers; you are tax gatherers." The implication is that utilities immediately raise rates to pass the burden back upon the consumer. In practice, however, rates are not adjusted yearly but are fixed and remain so for several years. If taxes are raised following a rate adjustment—and this seems usually to be the case—the company has to absorb the increase. If any utility company has applied for an increase in rates for the sole reason that its taxes have been increased, the case has escaped our attention.

State and local taxes have increased through natural increases in telephone property values and on account of increased tax rates to meet the cost of heavy public expenditures. When the increase has been due to these causes, the utility company can do little to prevent the increase. When, as has happened in some states, legislatures have attempted to apply special taxes which seem always to include utilities among those affected, individually and through associations, an effort can and should be made to see that no unfair proportion is unloaded onto utility companies. Political maneuvering has seemed to have reduced somewhat the prospect for early relief in the matter of federal taxes, but a reduction here is inevitable sooner or later it would seem.

Any single item that involves an expenditure of 7.5% of the revenue of a company and more than 25% of its operating income is one that merits careful supervision on the part of officers of a company. They at least can see that the property of the company is assessed at a reasonable valuation compared to other property in the territory served and can use whatever influence they possess to keep tax rates within reasonable limits. Through associated effort they can do much to prevent an unfair proportion of the total tax burden onto utilities under the assumption that utilities are "tax gatherers, not tax payers."

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## Stability of Industry Shows in 1927 Record

The annual telephone balance sheet will soon be drawn and the industry will have the opportunity to place 1927 along side of other years and compare results. Economists and financial writers, as well as executives of large business and of trade associations have already been making comparisons with other years and the general conclusion seems to be that it was a year of spotted results, as far as general business is concerned.

Some lines of trade showed a decided slowing up after the extreme activity of 1926, while other lines were not so much affected. Competition was keener

and there was some drop in the average of commodity prices. Farm conditions were improved somewhat, particularly in the western half of the Mississippi Valley, but the farmer is still suffering from the effects of a series of lean years. The New York Stock Exchange, in spite of a general slowing down of business, experienced one of its biggest years of activity which has caused it to lose something of its reputation as a barometer of business conditions.

The telephone business came through the year with splendid results. Reports of Class A companies to the Interstate Commerce Commission have shown a satisfactory increase in revenue over 1926, together with an increase in expenses at a slightly slower rate. Smaller companies in general will show similar results. The inherent stability of the business is again reflected in its ability to make progress in a year when other businesses have been marking time or actually slowing down. This stability is no small factor in the popularity of telephone securities among investors which has grown to such proportions in recent years.

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### "Hit or Miss" Method Is No Program

Nearly every telephone company has some kind of a construction program for the year. It is seasonal because of weather conditions and is at its height in the spring and early summer months. The surprising thing about it with many companies, is that it should be dignified by the name of a program. It is true that the management and supervisory forces have a general idea that certain jobs are to be done during a certain year, but that is about the extent to which the work is planned and scheduled.

If you were to ask how much it is proposed to spend on the program, the answer would be quite hazy, and if inquiry were made as to the estimated quantities of material, it is likely that the answer would be that the quantities have not yet been determined. If the facts were known, the quantities of material often are not determined until after the job is done and many times they are never determined.

On such a job, the material is ordered a few days before the work is to be started with little more than a hasty guess at the amount needed and without consideration of economical quantities for purchasing or possible needs on other jobs. Delays occur due to non-delivery of certain items or to exhaustion of the supply just at a time when it is needed.

It is needless to stress all of the disadvantages of this hit-or-miss type of construction program. The remedy is a real program, with definite plans of the amount and character of the work to be done, in which the work is scheduled as to approximate date of beginning and completion, and in which have been made fairly careful estimates of the quantities of material needed and the dates at which it should be available.

An old maxim says that a job well planned is half done and there is no better time to do this half of next summer's construction work than the two or three months before the spring season arrives.

---

### Correct Balance of Reserve Interest Rate-Makers

The adequacy of depreciation reserve accounts seems to be claiming the attention of commissions if some recent decisions are an indication. In several recent rate cases, commissions have taken the view that excessive reserves have been created and have taken this into account in determining the amount allowed to be earned from a new rate schedule. In an Indiana case, the rate of depreciation was set in the order at a very low point on the theory that the company had taken excessive depreciation in the past and that this should be compensated for by correspondingly low rate in the future.

In a Wisconsin case, the amount required to be earned to provide a fair return on the cost-of-reproduction-less-depreciation of the property was credited with an interest allowance on the alleged excess depreciation reserve before the rate schedule was adopted.

If this practice becomes common it will open up a number of interesting questions which, as far as we know, have not been directly covered by court decisions. It is quite generally held that past inadequacy or excess of earnings is not to be considered in determining a fair return for the future. Will this same doctrine apply to depreciation reserve? If book values are largely to be ignored in the determination of a rate base, can the book reserve be considered when it has a direct relation to the book value depending upon the manner in which plant extensions and retirements have been accounted in the past? Assuming that depreciation accounting has been handled properly in the past, will the book reserve at any given time necessarily be equal to the observed depreciation determined from an appraisal made as of the same date?

Until these and other questions have been decided it would seem to be good policy for those who prepare rate cases for presentation to be ready to submit evidence as to the adequacy of the book reserve and for the management of telephone companies to prevent the accumulation of seemingly excessive reserves by proper credits to plant and charges to the reserve when plant is retired.

# Telephonic Transmission Over Long Lines

By F. J. DOMMERQUE
*Fellow A. I. E. E.*

Short telephone lines are subject to all the disturbing effects just as much as long lines, but on account of their shortness these effects do not attain such proportion, that their influence can be noticed, as long as the lines are built with the ordinary precautions and of the materials used in standard practice. The power behind the transmitter originally carried the transmission over a few miles only, then over a few hundred miles. Then came loaded lines, which permitted conversation from New York to Denver; and finally came the repeater which boosted the transmission from New York as far as San Francisco and further.

To begin with the power behind the transmitter, which we will call the sound power input, this power varies according to the quality and quantity of the sound and also according to the construction of the transmitting apparatus from 0.1 to 15 milliwatts (1 mw. = one thousandth of a watt), or very small amount. As a mean we may take 2 mw. as sound power input. Of this amount an extremely small part reaches the other end of the line. The amount necessary to enable a subscriber of the every day kind to distinctly understand the conversation should be at least 0.002 milliwatts. Therefore of the 2 mw. impressed at the sending station, only 0.002 mw. arrive at the receiving station as a minimum; therefore the efficiency of transmission in the minimum permissible case may be expressed as the ratio of the sound power output to the sound power input, that is, as 0.002 to 2, giving as minimum requirement 0.001; in commercial operation the ratio lies between 0.001 and 0.01.

Before the advent of loaded lines the only means to extend the transmission distance was to increase the diameter of the wire, that is, to decrease the resistance of the line per mile. To talk from New York to Chicago was only possible over a line of No. 8 Birmingham wire gage. New York to Chicago may be counted 1,000 miles. As soon as this line was loaded and extended to Denver, a distance of 2,000 miles could be covered. And then with the insertion of repeaters it was made possible to talk from New York to San Francisco, a distance of 3,400 miles. At the beginning of 1921 the opening of submarine cables between Havana and Key West established a circuit from Havana to Catalina Island, 5,500 miles in length, including the submarine cables between Havana and Key West, a land line from Key West to New York, the overland line from New York to San Francisco, a land from San Francisco to Los Angeles and the final stretch from Los Angeles to Catalina Island with a wireless link between Long Beach and Avalon. On this circuit a sound power input of 1 milliwatt at San Francisco gave a sound power output of 0.025 milliwatts at Havana. The entire circuit contained 25 amplifier stations.

### Attenuation

Any transmission of energy is connected with a loss. The causes of the loss are manifold. We will briefly examine the causes for the loss of sound power in transmission. We know that sound waves are converted in the transmitter into electromagnetic waves of the same form as that of speech. The electromagnetic waves are alternating current waves, the frequencies ranging from 200 to 3,000 cycles per second. The talking current consists of a fundamental wave and a number of waves of higher periodicity, the latter being called the higher harmonics. The difference of periodicity causes the individual waves to find different resistances in a circuit containing inductance and capacity. This resistance has to be overcome by the energy on its way through the electrical field of the circuit, which causes a diminution of the energy, the diminution being more pronounced when the alternations of the current are faster. This effect, whether due to waste of energy by resistance in its path or to energy being radiated away in waves is called *attenuation*. As each one of the frequencies or rather the amplitude of the waves is differently attenuated, the sum of the waves arriving at the end of the line will not produce again the same form the current had at the beginning of the line. Consequently the form of the speechcurve is changed, a condition which is called *distortion*. This distortion is particularly noticeable in cables as the pairs of conductors in a cable form a condenser with the insulation between them. Two overhead conductors of an aerial circuit form also a condenser with the air as insulation between them, the capacity of which is large enough on very long lines to effect a considerable loss of current. Furthermore, on such long lines not only the electrostatic capacity is to be rockened with, but also the effect of loss of current by imperfect insulation, which may be considerable in rainy weather. This leakage of current is the reverse of insulation resistance and is expressed in mhos, the reverse of ohms.

From the foregoing it is evident that in any telephonic transmission the four electrical characteristics of the line, namely resistance, inductance, capacity and leakance determine the attenuation of the sound power entering the line.

As our intention is not to employ either in this or any subsequent articles higher mathematics than the ones treated in previous articles on Telephone Mathematics and Physics, we will not go into the deduction of attenuation formulas, as this would require higher mathematics, but will simply state that for the measure of attenuation in a circuit a factor can be calculated which expresses the losses of talking current per mile or kilometer of the circuit, as the case may be. This factor is called the "Attenuation Constant" and is commonly designated by the Greek letter $\alpha$. We will give formulas for the value of $\alpha$ accurate enough for practical calculations and in addition we will give the constants for 1 mile of such circuits as are mostly met with in practice.

In open wire lines the inductance is comparatively high, in fact in the long lines it is found that the reactance to L is as a rule larger than three times the ohmic resistance R. If this is the case the attenuation constant

$$\alpha = \frac{R}{2}\sqrt{\frac{C}{L}} + \frac{G}{2}\sqrt{\frac{L}{C}},$$

wherein

R = the resistance of the circuit per loopmile or loopkilometer in ohms;
L = the inductance of the circuit per loopmile or loopkilometer in henrys;
C = the capacity of the circuit per loopmile or loopkilometer in farads;
G = the leakance of the circuit per loopmile or loopkilometer in mhos.

In cables conditions are different; capacity is comparatively high and the value of wL small against the value of R; then the approximate formula $\alpha = \sqrt{\frac{wCR}{2}}$ may be used.

In this formula w equals $2\pi n$, where n is the frequency, which in telephonic transmission ranges from 200 to 2,000 cycles per second; it has become the common usage to consider 800 cycles per sec-

ond or also w = 5,000 as a fair average to use in calculations, as at this frequency the telephone receiver is most sensitive.

Attention may be called to the fact that the values of C, L and G are mostly given in microfarads, millihenrys and micromhos as more convenient; the equivalents are easily remembered, namely:

1 microfarad (m. f.) = 1 millionth of a farad = farad $\times 10^{-6}$.
1 millihenry = 1 thousandth of a henry = henry $\times 10^{-3}$.
1 micromho = 1 millionth of a mho = mho $\times 10^{-6}$.

**Table of Constants Per Loop-Mile for Open Wire**

| Wire gage. | R in ohms. | C in micro-farads. | L in milli-henrys. | Attenuation constant. |
|---|---|---|---|---|
| No. 6 B. & S. G. | 4.176 | 0.00894 | 3.38 | 0.0043 |
| No. 8 B. & S. G. | 6.64 | 0.00854 | 3.53 | 0.0062 |
| No. 9 B. & S. G. | 8.376 | 0.00836 | 3.60 | 0.0079 |
| No. 10 B. & S. G. | 10.56 | 0.00818 | 3.68 | 0.0088 |
| No. 12 B. & S. G. | 16.798 | 0.00786 | 3.83 | 0.0124 |
| No.8 Birm. W. G.. | 4.12 | 0.00900 | 3.37 | 0.0042 |
| No. 12 N. B. S. G. | 9.98 | 0.00821 | 3.63 | 0.0086 |

**Table of Constants Per Loop-Mile for Cable**

| Wire gage. | R in ohms. | C in micro-farads. | L in milli-henrys. | Attenuation constant |
|---|---|---|---|---|
| No. 19 B. & S.Stand. | 87.530 | 0.054 | (*) | 0.107 |
| No. 10 B. & S. G.. | 10.56 | 0.0714 | 1.0 | 0.036 |
| No. 13 B. & S. G.. | 21.17 | 0.0714 | 1.0 | 0.056 |
| No. 14 B. & S. G.. | 27.38 | 0.0714 | 1.0 | 0.0656 |
| No. 16 B. & S. G.. | 42.442 | 0.0714 | 1.0 | 0.0937 |
| No. 19 B. & S. G.. | 87.530 | 0.0714 | 1.0 | 0.1248 |
| No. 20 B. & S. G.. | 107.316 | 0.0714 | 1.0 | 0.1397 |
| No. 22 B. & S. G.. | 170.566 | 0.0714 | 1.0 | 0.1800 |

*Negligible.

The above tables give about all the data a practical telephone man needs. There are formulae and rules for calculating capacity and inductance, namely: Capacity of 2 parallel wires of radius r and centerdistance d in microfarad per

$$\text{loopmile} = \frac{0.01942}{\log_{10}\frac{d}{r}};$$

and for inductance of 2 parallel wires expressed in henry per

$$\text{loopmile} = (0.1609 + 1.482 \log_{10}\frac{d}{r})\ 10^{-3};$$

but in the first place it is very hard to obtain by calculation the exact inductance, and second are cables not composed of parallel wires. We will, however, add an example of the calculation of the attenuation constant for an open wire line and a cable.

The open wire line may consist of No. 8 B. W. G. copper wire. Then the loop resistance would be R = 4.12 ohms. The capacity C = 0.009 m. f. or $9 \times 10^{-9}$ farads per loop mile (from the table). The inductance L = 3.37 millihenrys or 0.00337 henrys per loop mile (from the table). As leakance, which is a rather uncertain feature, we may assume



G = 3 micromhos or $3 \times 10^{-6}$ mhos per loopmile. Then

$$\alpha = \frac{R}{2}\sqrt{\frac{C}{L}} + \frac{G}{2}\sqrt{\frac{L}{C}} =$$

$$\frac{4.12}{2}\sqrt{\frac{9 \times 10^{-9}}{0.00337}} + \frac{3 \times 10^{-6}}{2}\sqrt{\frac{0.00337}{9 \times 10^{-9}}}$$

$$= 2.06 \times 0.001634 + \frac{3 \times 10^{-6}}{2} \times 612$$

$$= 0.003366 + 0.000918 = 0.00428,$$

which agrees fairly well with the value given in the table.

As an example for a cable, we may take a No. 16 B. & S. G. cable. The table gives as loop resistance R = 42.442 ohms; as capacity C = 0.0714 m. f.; as inductance 1 millihenry. We know that the value of 1 millihenry is rather high for this cable and is only inserted in the table to give some value, although practically the inductance of a cable is negligible as it is assumed in the formula $\alpha = \sqrt{\frac{wCR}{2}}$. This formula neglects also the leakance, in a cable should be no leakage.

With the above data we obtain

$$\alpha = \sqrt{\frac{5000 \times 0.0714 \times 10^{-6} \times 42.442}{2}}$$

$$= \sqrt{0.007576} = 0.087,$$

which is slightly lower than the value 0.0937 given in the table. The value in the table is the safer one, as it probably is based on some leakage being present besides some inductance.

**Transmission Units**

Until a few years ago the standard unit for comparing transmission was a No. 19 B. & S. G. paper cable, having a resistance of 88 ohms per loopmile (54.68 ohms per loopkilometer), a capacity of 0.054 microfarads per loopmile (0.03355 m. f. per loopkilometer) and an inductance of $1 \times 10^{-3}$ henrys per loopmile ($0.6213 \times 10^{-3}$ henrys per loopkilometer). This was the standard in the U. S. The cable was the kind that was in use in the earlier days and therefore was adopted as unit; that is, one mile of standard cable was made the first transmission unit in this country. This unit was an arbitrary one, but it was convenient and practical. In recent years, where progress in telephone engineering was very rapid, it was found as insufficient and not in accordance with the scientific plane upon which telephony as an art had arrived, and a new standard of transmission was established. This transmission unit was designated by the letters TU and so chosen that two amounts of power differ by one transmission unit when they are in the ratio of $10^{\frac{1}{2}}$, and any two amounts of power differ by N units when they are in the ratio of $10^{N(.1)}$. We will not go into a discussion of this TU, anyone interested in its technical qualifications may read the paper on the Transmission Unit and Telephone Transmission Reference Systems by W. H. Martin*, all that we are interested in is its practical application.

Every telephone man is familiar with the standard cable mile as a transmission unit; the easiest way to form an idea of the new TU is to compare it with the standard cable mile. There is not much of a numerical difference as 1 TU is equal to 1.056 Standard cable miles; to change standard cable miles into TU'S multiply by 0.9467.

The European telephone engineers, at least on the European continent where the metric system is in use, never adopted the standard cable mile, but use as transmission unit the attenuation constant per kilometer; thus they determine the quality of transmission by the attenuation constant and the length of circuit over which the transmission takes place. They, however, designate the attenuation constant by the Greek letter $\beta$ instead of $\alpha$. We designate by $\beta$ the wavelength constant, which the European engineers designate by $\alpha$. The relation between attenuation constant $\alpha$ and wave length $\beta$ is expressed by the equation $\alpha + j\beta = \gamma$, where $\gamma$ is the propagation constant and $j = \sqrt{-1}$. We are now interested in the attenuation constant only.

The European engineers state that the quality of transmission ranges about as follows:

If the product $\beta l$, that is, the attenuation constant multiplied by the length of line, equals 1.5, the transmission is considered perfect:
for $\beta l = 2$, it is still good;
for $\beta l = 2.5$, it is normal;
for $\beta l = 3$, it is still commercial;
for $\beta l = 4$, it is poor, and
for $\beta l = 5$, it is bad.

In America we do not make such a detailed distinction; we have a rule which says that the limit of transmission where the persons carrying on conversation fail to understand each and every word, may be set at 30 miles of standard cable; that "good" transmission can be obtained over a circuit equivalent to about 18 miles of standard cable. It is customary not to go over 20 miles of standard cable for local circuits.

Now a standard cable mile equals 0.109 $\beta l$; therefore, 18 cable miles equal $18 \times 0.109\ \beta l$ or $1.962\ \beta l$. In the table

*Journal A. I. E. E., June, 1924.

giving the quality of transmission for $\beta l$ the transmission for $\beta l = 2$ was rated as good, which compares favorably with the American rule. Therefore we may establish the following table for the quality of transmission pertaining to the new American TU:

| Quality of transmission. | $\beta l$. | Standard cable miles. | TU. |
|---|---|---|---|
| Perfect | 1.5 | 13.76 | 13 |
| Good | 2 | 18.35 | 17.37 |
| Normal | 2.5 | 22.94 | 21.715 |
| Still commercial | 3 | 27.525 | 26 |
| Poor | 4 | 36.7 | 34.75 |
| Bad | 5 | 45.875 | 43.43 |

### Transmission Equivalents

The following table gives the transmission equivalents of various lines and pieces of apparatus, that is, the mileage which gives transmission equal to that given by *one* mile of standard cable and equal to *one TU*.

| | Miles equivalent to 1 mile standard cable. | Miles equivalent to 1 TU. |
|---|---|---|
| Open wire. | | |
| No. 6 B. & S. gage copper wire | .25 | 23.7 |
| No. 8 B. & S. gage copper wire | 17.25 | 16.3 |
| No. 9 B. & S. gage copper wire | 15.62 | 14.78 |
| No. 9 B. & S. gage copper wire, phantom | 18.5 | 17.6 |
| No. 10 B. & S. gage copper wire | 12.16 | 11.51 |
| No. 12 B. & S. gage copper wire | 8.63 | 8.15 |
| No. 12 N. B. S. gage copper wire | 12.50 | 11.8 |
| No. 12 N. B. S. gage copper wire, phantom | 15.00 | 14.3 |
| No. 8 B. W. gage copper wire | 28.60 | 27. |
| No. 8 B. W. gage copper wire, phantom | 34.5 | 32.3 |
| No. 10 B. W. gage BB iron wire | 4.0 | 3.78 |
| No. 12 B. W. gage BB iron wire | 3.1 | 2.935 |
| No. 14 B. W. gage BB iron wire | 2.5 | 2.37 |
| No. 14 N. B. S. gage copper wire | 8.2 | 7.75 |
| No. 14 N. B. S. gage copper wire, phantom | 9.5 | 9 |
| No. 8 B. W. gage copper wire, loaded | .66 | 62.5 |
| No. 8 B. W. gage copper wire, loaded phantom | .75 | 71 |
| No. 12 N. B. S. gage copper wire, loaded | 30.3 | 28.6 |
| No. 9 B. & S. gage copper clad wire (47%) | 8.1 | 7.65 |
| No. 10 B. & S. gage copper clad wire (47%) | 6.8 | 6.43 |
| No. 12 B. & S. gage copper clad wire (47%) | 4.9 | 4.63 |
| No. 14 B. & S. gage copper clad wire (47%) | 3.6 | 3.4 |
| *Cable* (500 megohms insulation resistance): | | |
| No. 10 B. & S. gage, mutual capacity 0.074 m. f. | 2.55 | 2.45 |
| No. 10 B. & S. gage, mutual capacity 0.074 m. f., phantom | 2.85 | 2.69 |
| No. 13 B. & S. gage, mutual capacity 0.074 m. f. | 1.82 | 1.72 |
| No. 13 B. & S. gage, mutual capacity 0.074 m. f., phantom | 2.04 | 1.9 |
| No. 14 B. & S. gage, mutual capacity 0.074 m. f. | 1.61 | 1.52 |
| No. 14 B. & S. gage, mutual capacity 0.074 m. f., phantom | 1.82 | 1.72 |
| No. 16 B. & S. gage, mutual capacity 0.074 m. f. | 1.28 | 1.21 |
| No. 16 B. & S. gage, mutual capacity 0.074 m. f., phantom | 1.43 | 1.35 |
| No. 19 B. & S. gage, mutual capacity 0.074 m. f. | 0.90 | 0.85 |
| No. 19 B. & S. gage, mutual capacity 0.074 m. f., phantom | 0.1 | 0.95 |
| No. 22 B. & S. gage, mutual capacity 0.70 m. f. | 0.65 | 0.614 |
| No. 22 B. & S. gage, mutual capacity 0.70 m. f., phantom | 0.74 | 0.7 |
| No. 22 B. & S. gage, mutual capacity 0.083 m. f. | 0.60 | 0.567 |
| No. 22 B. & S. gage, mutual capacity 0.083 m. f., phantom | 0.68 | 0.643 |
| *Miscellaneous:* | | |
| No. 14 B. & S. gage rubber covered copper distributing wire | 1.25 | 1.18 |
| No. 18 B. & S. gage bridle wire | 0.625 | 0.59 |
| No. 22 B. & S. gage silk and cotton covered switchboard cable | 0.45 | 0.425 |
| No. 19 B. & S. gage silk and cotton covered switchboard cable | 0.59 | 5.58 |
| No. 19 B. & S. gage wool covered switchboard cable | 0.67 | 6.33 |
| No. 16 B. & S. gage wool covered switchboard cable | 0.91 | 0.86 |
| No. 16 B. & S. gage submarine cable (impregnated paper) | 0.71 | 0.67 |
| No. 19 B. & S. gage submarine cable (impregnated paper) | 0.53 | 0.5 |
| 3 No. 22 B. & S. gage submarine cable (rubber) | 0.63 | 0.595 |
| No. 13 B. & S. gage underground cable, heavy loaded | 8.85 | 8.36 |
| No. 13 B. & S. gage underground cable, medium loaded | 8.55 | 8.08 |
| No. 13 B. & S. gage underground cable, light loaded | 7.4 | 7.0 |
| No. 14 B. & S. gage underground cable, heavy loaded | 7.57 | 7.15 |
| No. 14 B. & S. gage underground cable, medium loaded | 7.14 | 6.75 |
| No. 14 B. & S. gage underground cable, light loaded | 6.25 | 5.9 |
| No. 16 B. & S. gage underground cable, heavy loaded | 5.88 | 5.56 |
| No. 16 B. & S. gage underground cable, medium loaded | 5.13 | 4.75 |
| No. 16 B. & S. gage underground cable, light loaded | 4.03 | 3.82 |
| No. 19 B. & S. gage underground cable, heavy loaded | 3.6 | 3.4 |
| No. 19 B. & S. gage underground cable, medium loaded | 2.87 | 2.71 |
| No. 19 B. & S. gage underground cable, light loaded | 2.17 | 2.03 |
| No. 22 B. & S. gage underground cable, heavy loaded | 1.89 | 1.78 |
| No. 22 B. & S. gage underground cable, medium loaded | 1.42 | 1.34 |
| No. 22 B. & S. gage underground cable, light loaded | 1.05 | 0.99 |
| A wire-wound heat coil | 0.5 | 0.47 |
| A 1,000 ohm bridged drop | 0.15 | 0.14 |
| A 500 ohm bridged drop. | 0.975 | 0.92 |
| A 200 ohm bridged drop. | 2 | 1.89 |
| A 2 m. f. condenser | 0.16 | 0.15 |
| A 1,000 ohm bridging bell | 0.1 | 0.95 |
| 6 foot 2-conductor steel switchboard cord | 0.25 | 0.237 |
| 6 foot 2-conductor tinsel switchboard cord | 0.03 | 0.028 |
| A No. 118-A Western Electric relay connected in series | 0.35 | 0.33 |
| A No. 25-A Western Electric repeating coil | 0.5 | 0.47 |
| A No. 37-A Western Electric phantom coil (to phantom) | 0.25 | 0.237 |
| A No. 37-A Western Electric phantom coil (to physicals) | 1.5 | 1.4 |
| A No. 37-B Western Electric phantom coil (to phantom) | 0.05 | 0.047 |
| A No. 37-B Western Electric phantom coil (to physicals) | 0.25 | 0.237 |
| Standard composite set (to phantom) | 1 | 0.945 |
| Standard composite set (to physicals) | 1.5 | 1.4 |

The equivalent for the composite sets includes the composite equipment at both ends of the circuit. The loss of one mile to phantom is on the basis that both side-circuits but not the phantom itself is composited. As a rule open wire phantom circuits are from 15 to 20% and cable phantom circuits from 8 to 10% better than the physical circuits.

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Wilkes Barre, Pa.—Senator A. J. Sordoni has bought control of the Commonwealth Telo. Co. of Harvey's Lake, where he is pres. and g.m. of the Light Co.

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Holly, Colo.—Holly-Stonington Telo. Co. sold to Mountain States T. and T. Co.

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Sumter, S. C.—Continental Telo. Co., St. Paul, Minn., has bought Sumter Telo. Co. and plans making Sumter headquarters for Continental's Carolina properties.

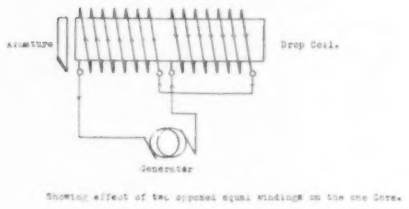
# Studying Details of Telephone Work

By E. R. COLLINS
*Wire Chief, Manitoba Telephone System*

CHAPTER XII

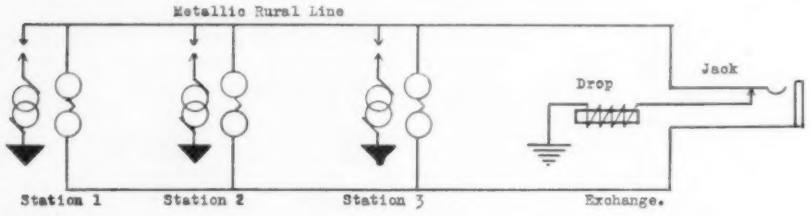
### Push Button Ringing for Rural Lines

In the previous paragraphs, we have been dealing with unbalances due to capacity differences. We have not taken into consideration inductive interference due to parallel lines, but only to earth noises due to difference in capacity of the sides of the line. In some rural systems, push buttons are provided, so that the subscribers can signal the operator at the exchange by pressing the button and ringing. This system gives a silent ring when the operator is being called.




Showing effect of two opposed equal windings on the one core.

(*Fig.* 87)




Showing Rural Magneto Line equipped for Push Button Ringing. Line Coil connected to one side of Line. Line noisy when Subscribers talk on same line.

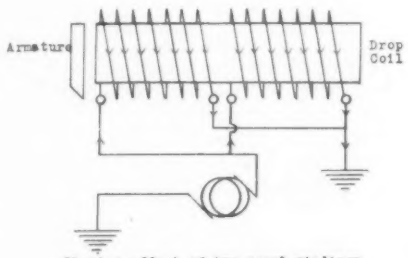
(*Fig.* 86)

In Fig. 86 three telephones are shown connected to a rural line. The line drop is connected through the jack to one side of the line. Suppose there is a bad 60 cycle power interference along this line. Then the 60 cycle current induced would find a low resistance path to ground through the line drop at the exchange. When Station 1 and 3 are talking together, the drop would be connected and the noise might be bad. When the operator plugs in on the line, however, she cuts the drop off, and the line is balanced, and she heard no noise. Such noise condition might exist without the trouble man being aware of it. In such cases a receiver bridged across the line at the rack, with the jack normal, is a good test to see how bad the noise is.

Suppose Station 1 had his line reversed, and the generator through the button connected to the lower side of the line as shown in Fig. 86. Then his generator current to reach the drop on the other side of the line would have to travel over the bells at Stations 1-2-3, and then through the drop to ground. Of course all bells would ring and the purpose of the system defeated.

### Differential Wound Coils

In Fig. 87 we show a drop coil wound in two equal sections. The windings are both wound in the same direction. Connect the two windings in series, as shown in Fig. 87, and observe that the direction of the current flow in one winding is opposite to the other. The magnetic field therefore will be opposite. Now if the two coils are equal, their magnetic fields will be equal, but opposite. The pull on the armature will be almost nothing. There will be a slight difference in the pull of the coil nearest the armature over the other, where two separate coils are wound on the core. To all appearance, however, there will be no effect on the armature. This is called a differential arrangement.

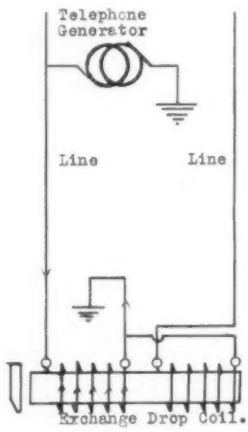



Showing effect of two equal windings with windings aiding each other.

(*Fig.* 88)

In Fig. 88 we have the same coil, but the two windings are connected so that the current flow sets up magnetic fields in the same direction. Here the generator is connected so that it operates the two coils in parallel, that is the ringing current divides, and goes half through each winding to ground, in such a direction that the armature is pulled up.

In Fig. 89 we have such a double wound coil connected across the line at the exchange with the center point of the coil grounded. When a subscriber rings in over one side of the line, his generator is only operating one-half of




Showing effect of Push Button Line where one winding of balanced coil is used to signal the operator,

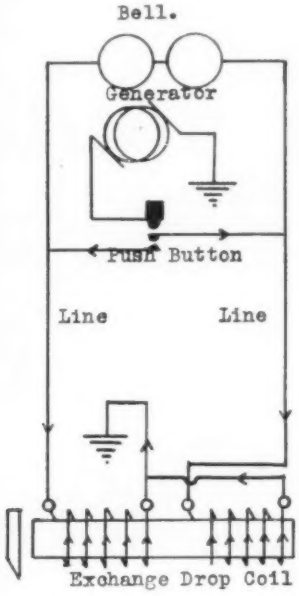
(*Fig.* 89)

the drop coil. Such a coil would be only half as sensitive as the same coil connected as in Fig. 86. However, the line is balanced, in that there is an equal path to ground to both sides of the line at the exchange. Such a line would not show a noise such as we had in Fig. 86.

In Fig. 90 we show the same coil as in Fig. 89, but here we have the push button so arranged that when it is pressed, it grounds the generator, but also puts a short circuit on the line at the telephone. This has a double effect. It prevents any of the bells on the line from ringing due to ground leakage, and it also provides a double path for the generator current over both sides of the line through both halves of the drop coil to ground. Here we have made the drop twice as efficient as in Fig. 89.

In Fig. 91 we show the complete push button arrangement, using five springs, to transfer the generator to ground, and short the line in the one operation. At the exchange we have balanced the line by using a retardation coil as shown in Fig. 91, taking the center point of the coil to ground through the line drop coil.

This system permits using the existing line drop, as the retardation coil can be mounted in any convenient place in the exchange. In Fig. 89 and 90, should a subscriber ring some one on his own line,

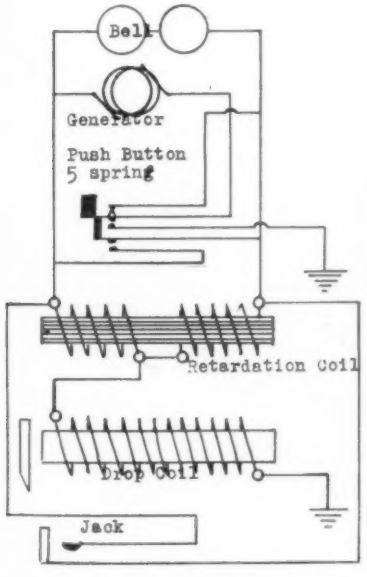



**Showing Push Button System using both windings of Balanced Drop Coil to signal Operator.**

(*Fig.* 90)

the path of the generator current would be from one line wire to the other. The effect of ringing metallic on such a line would be the same as in Fig. 87. That is, there would be no pull on the armature of the drop, as the two coils would be opposing each other.

We have taken the study of some line




**Showing Push Button System using a 5 Spring Push Button, at Telephone and a Retardation Coil and Drop Coil at Exchange. Line balanced and quiet.**

(*Fig.* 91)

unbalance conditions at this so that when we are dealing with further apparatus and circuit arrangements, the importance of a balanced talking circuit through all our exchange apparatus will be more easily appreciated.

## Holborn, London's First Automatic Exchange, Cut Over

By A. C. Blackall

The automatic telephone service at the Holborn Exchange, the first to be installed in London for public use, came into operation at midnight, November 12-13. The actual change over from the manual to the automatic system was completed in two minutes. Tests were carried out during the night by the engineers and over part of the apparatus the following day by the operating staff. As Holborn is in the main a business man's exchange, only a limited number of subscribers could be called on a Sunday. All the remaining lines have since been tested, the tests being spread over an entire day as quickly as the response of the subscribers would allow.

On the opening day it was reported that the system was working well, and that when subscribers had become familiar with the "dialing" it would give complete satisfaction.

Following the conversion of the Holborn Exchange it is expected that in about six weeks' time the Bishopsgate and Sloane exchanges will become automatic, to be followed later by the Western and Monument exchanges. Many years must elapse, however, before the whole of the London exchanges, of which there are now about 80, can be equipped with the automatic apparatus. New exchanges, which with the rapid growth of the telephone service in London will make necessary in the future, will be automatic from the start. So long as the automatic and manual systems are both in use the remarkable scheme of having an exchange within an exchange must be retained at Holborn and other converted stations. Nothwithstanding the difficulty presented by the "tandem" working, the problem, it is stated, has been satsifactorily solved.

Although the Holborn Exchange is the first public automatic exchange to be put into operation in London, the exchange known as Official which connects Government departments and also takes calls to those departments from public exchanges has been worked automatically since 1912. Epsom has also had the automatic system for 15 years. In the country between 60 and 70 automatic exchanges are in operation. The existing manual exchanges in Sheffield were converted into one automatic exchange in 1927.

There are now in London some half million lines and it is not expected that complete automatic exchanges will be in existence until between 1940 and 1950. During the intervening period it is expected that the London service within the ten-mile area will have expanded to include 120 exchanges and 2,000,000 lines. When the automatic system is completed there will actually be 2,000 more girls employed than there are at the present time.

After the first full day's working of the new exchange, both the operators and engineers described their experience as "hectic." There was some congestion, mainly owing to subscribers using their instruments incorrectly, but there was no breakdown in the system. One of the chief engineers estimated that during the day 100,000 calls passed through the exchange as against about 60,000 to 70,000 calls on a normal day. A large proportion of the calls were obviously "curiosity traffic" put through by persons anxious to hear what the sounds were like.

A staff of about 300 operators, working in shifts, act as agents between the subscribers on manual exchanges and those on the Automatic exchange. On the floor below is the automatic exchange, and on the ground floor is the testing room for both exchanges. The basement is devoted to the power plant and machines.

## C. M. Taylor to Push Western Union Preservative

New York City—C. Marshall Taylor has been appointed Vice-President and General Manager of the Curtin-Howe Corp., 11 Park Place, who hold the commercial rights to the new wood preservative developed by the Engineering Laboratories of the Western Union Telegraph Co.

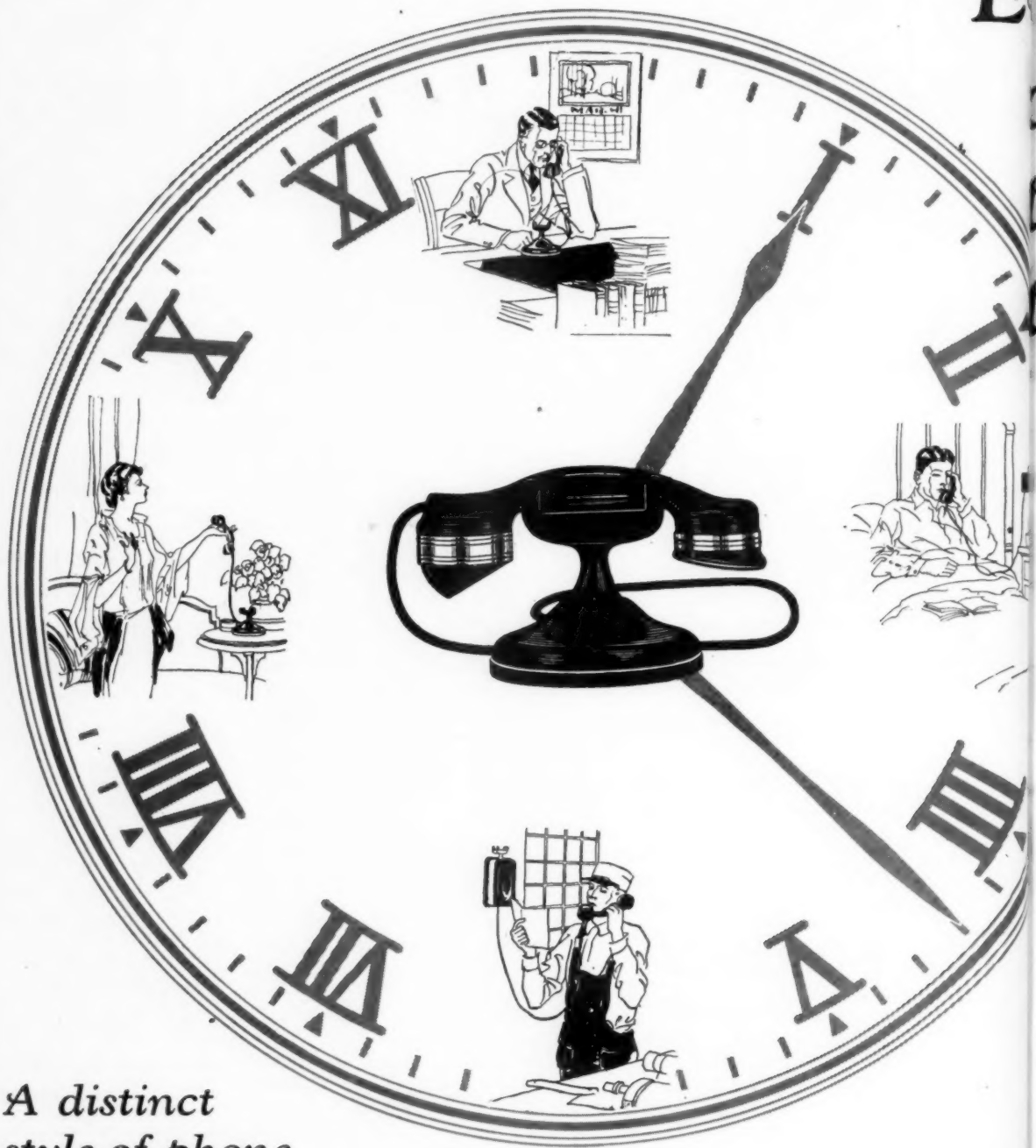
Mr. Taylor has been actively engaged in wood preservation since 1906.

The Engineering Laboratories of Western Union have developed zinc meta-arsenite as its standard preservative. It is permanently fixed in the wood using the standard processes now utilized in the wood preserving industry. The wood retains its natural color.

## Northern White Cedar Men Meet Jan. 31-Feb. 1

Minneapolis, Minn.—The thirty-second Annual Meeting of the Northern White Cedar Association will be held at Minneapolis on Tuesday and Wednesday, January 31st and February 1st.

An especial effort will be made to draw a large attendance of those engaged in the production and sale of posts, poles, ties, and pulpwood, whether members or not, and extensive preparations are being made for their entertainment.



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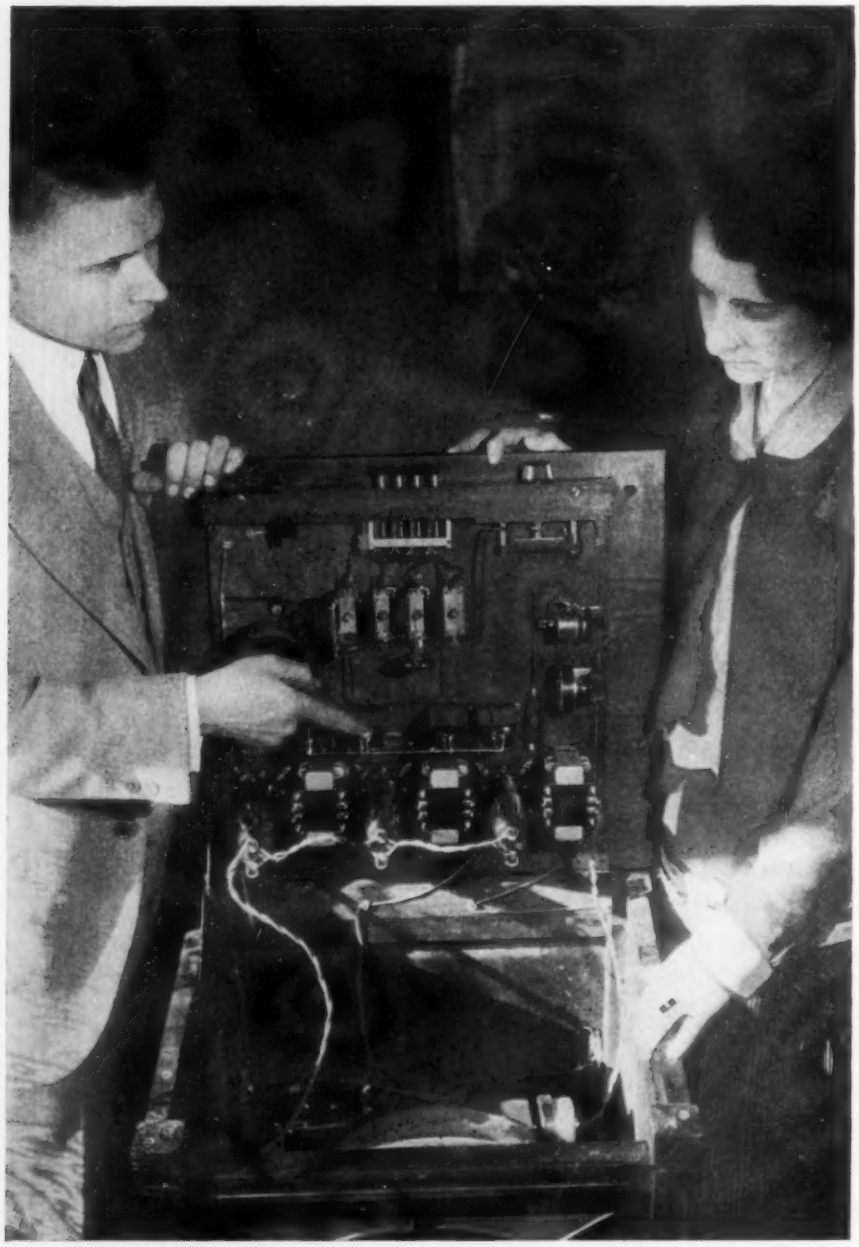
# Freeport's Program Service Promises Big New Profit Field

By GEORGE R. EATON

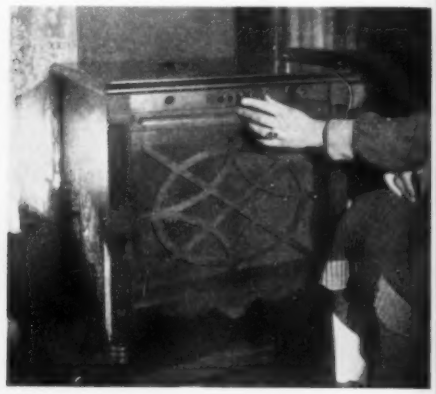
*Chief Engineer Kellogg Switchboard & Supply Company*

The words "Program Service" are an outgrowth of the furnishing of programs by telephone companies over the telephone wires to the subscribers. This class of so-called "wired programs" has been more or less successful for several years. It has, in fact, become sufficiently important for the banding together of telephone companies furnishing this type of service into the National Program Service Association. The systems so far in use supply these programs at audio frequencies over special telephone circuits. Installations are now in operation furnishing this service to as many as 1400 subscribers in a single city.

Telephone cables do not lend themselves readily to the transmission of the necessary broad band of frequencies required in supplying high grade musical programs. It should be understood that these cables were designed and built for voice frequencies, which cover a considerably narrower band or frequencies than that required for program service. It has been found that only two subscribers can be supplied satisfactorily on a cable pair and the output voltage to this particular circuit must be below a certain value or resultant cross talk would be experienced in the cables. The higher frequencies which must be handled in program service work "cross talk" more readily than though highest frequencies which are encountered in ordinary telephone work. Cross talk, therefore, limits the voltage which may safely be applied to the program service circuits, and makes it necessary to use high capacity rather than high voltage amplifiers. This, in turn, makes it necessary to use a large number of amplifiers.



*Interior of receiver showing the three alternating current tubes, condensers, transformers, power pack and speaker*



*The receiving unit closed ready for operation. Note the convenient push buttons for selecting stations and the volume control knob.*

The Kellogg Switchboard & Supply Co. early experimented with this type of program service, and their engineers felt that these programs if furnished over telephone circuits, should be supplied at other than audio frequencies.

About this time Major Gen. Geo. O. Squiers filed an application covering the possibilities of using high frequencies for supplying programs over telephone circuits. This principle has been experimented with on electric light circuits.

### Freeport's Experience

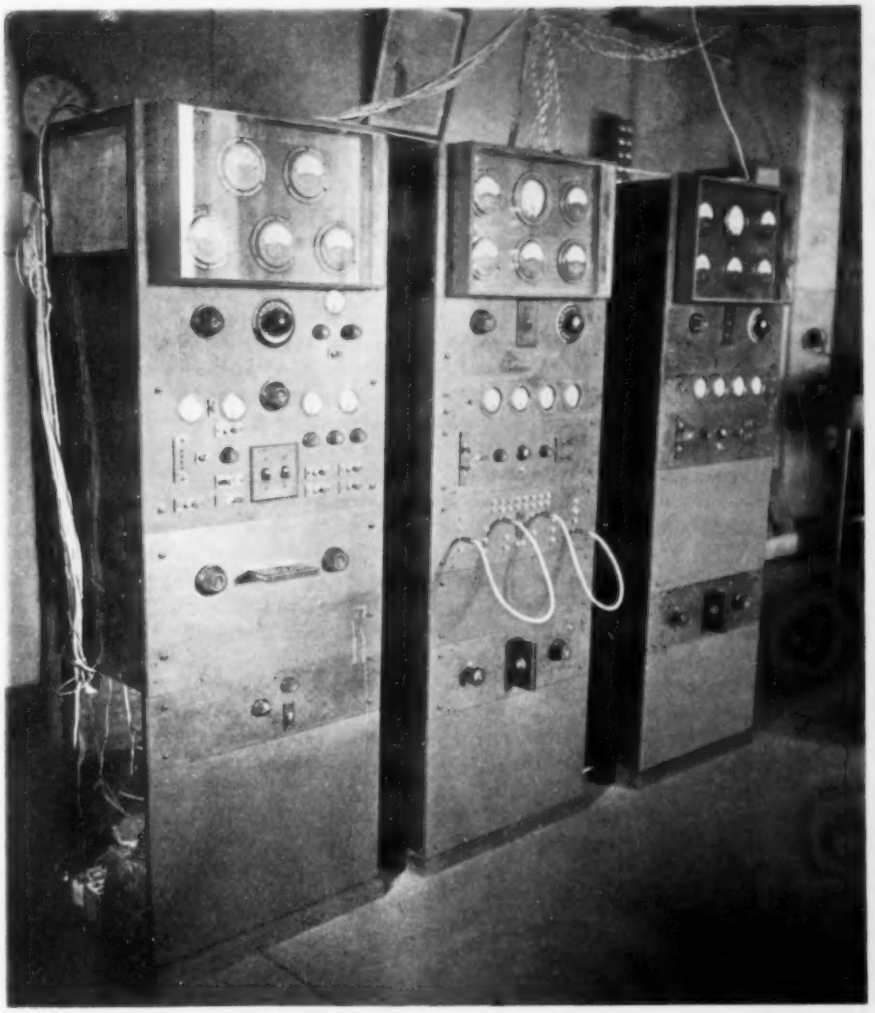
An experimental station was started in the plant of the Stephenson County Tel. Co., Freeport, Ill., with Geo. X. Cannon as general manager, to experiment and determine the possibilities of supplying

program service at other than audio frequencies. The following assumptions were made and had to be verified by actual experimental tests, as it was impossible to make any except very general calculations.

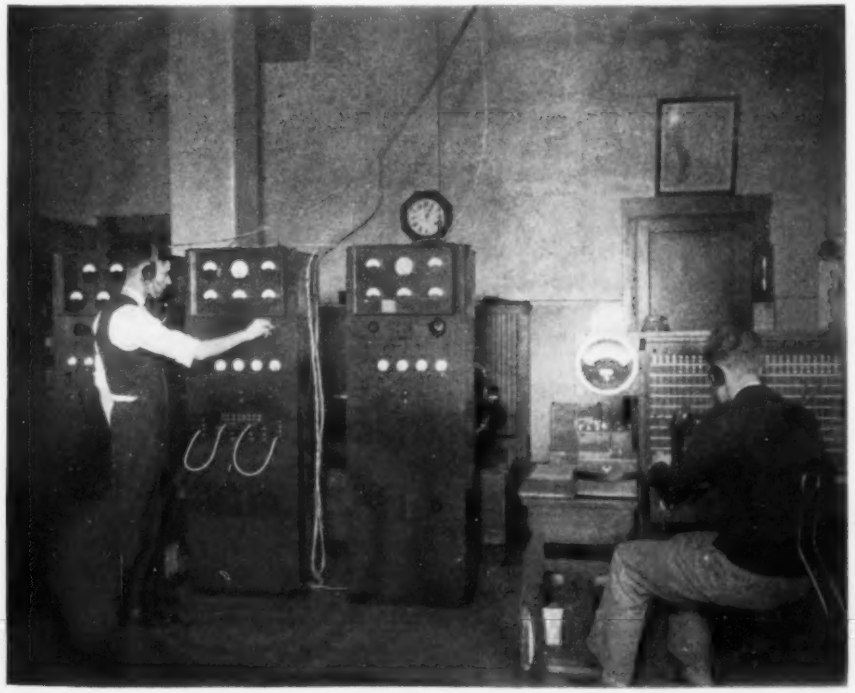
It was believed that it would be possible to find a band of frequencies over which a number of programs could be simultaneously distributed to all cable pairs in the telephone plant through the capacity between pairs in the cable. In other words, it was proposed to excite a cable pair with a group of programs from suitable apparatus; those programs to be distributed to all other cable pairs through the capacity of the cable. Knowing the capacity of the cable, it was possible to calculate approximately the most efficient band under ideal conditions. In the average telephone plant, these ideal conditions do not exist.

A large percentage of the cable pairs in the plant may be directly connected to ground. The cable sheath may or may not be grounded. Losses through common grounded groups such as the returns on common battery line circuits can be made negligible by inserting impedances of low resistance in these common grounds if high frequencies be employed for program distribution. Investigations showed that if a large group of line circuits were connected to ground on one side, barriers were necessary. In the entire group of experiments this was the only change which was required to be made on any telephone equipment, and in this particular instance it consisted of 5-impedance coils.

Having determined the most efficient band, it was necessary to determine the power required to give satisfactory distribution. It was possible to obtain satisfactory reception at the subscriber's end of any one of the 5,400 cable pairs at the experimental station by means of a simple detector and two-stage amplifier when 22 pairs were excited from a single 50-watt program supply unit. The sensitivity of the pick up device of course determines the size of the program supply unit.



*A close-up view of the supply units used in distributing programs through local telephone cables*



*The Central Station equipment consisting of three program supply units containing the necessary amplifier and modulating systems*

### System Installed

The system as finally placed in operation consists of a studio, or other means for supplying programs from which programs are carried in to the central office over cable pairs at audio frequencies. To carry in the three programs being supplied, without distortion, it was necessary to balance or equalize these pairs. Three program supply units are installed at the central office together with the necessary amplifier and modulating systems. The triple unit is connected to the required cable pairs which serve as an antenna system and to the ground for return. At the subscriber's station is a cabinet con-

(Continued on page 39.)

# Practical Suggestions for Plant Valuation

By CHARLES W. McKAY, M. E.*

CHAPTER VII

At the beginning of the new year it is difficult for one (especially for one who is accustomed to expressing his thoughts in written form) to refrain from reviewing the events of the past year, and also from doing a bit of "forecasting" as to the coming year.

The present series of articles began in the July, 1927, installment of TELEPHONE ENGINEER. The first article was prefaced, however, by an article appearing in the June installment, entitled "Common Sense and Telephone Finance." Naturally the subject of the latter article and the subject matter as presented in this series are very closely allied.

It may not be amiss, therefore, to refer to the financing article, as appearing in the June installment, with the thought of discussing, very briefly, some of the major events which have taken place during the year 1927.

There have been many purchases and sales of Independent telephone properties and, quite naturally, the majority of these purchases and sales have had to do with the merging of properties into larger Independent operating units.

Despite pessimistic opinions to the contrary, however, the balance of the power (with respect to the aforementioned Independent properties) remains outside of the jurisdiction of the Bell companies—in other words, the balance of the power remains in the hands of the Independent operators, and their financial backers.

Another fact, which is especially gratifying to the writer, is that his prognostications (as incorporated in the June article) have proven to be fundamentally correct. In other words, in my opinion, at least, the disturbed mental attitude of certain Independents—with respect to their relations with reputable banking concerns—has passed. True, in 1926 and early in 1927, certain unscrupulous financial concerns attempted rather questionable operations. Conditions of this kind were in the minority, however, and at the present time I believe that the whole situation has been entirely "ironed out," so as to obviate the possibility of a repetition of any such overtures from questionable "bankers."

The fact that such a condition *did* exist is no reflection upon the banking profession as a whole. There are "quacks" in every line of business—we find "quack" doctors and "shyster" lawyers, but this does not, for one moment, tend to discredit either the medical or legal professions. The constructive result is that the doctors and lawyers have taken definite and positive action to eliminate the undesirable element from their respective professions. And this is what has happened in the field of telephone finance—with the very able aid of the National and State Associations. In other words, the relationship between the telephone executive and the banker has passed the evolutionary stage and has settled down to a permanent state of "normalcy."

During the year 1927—and especially during the latter portion of this year—many desirable telephone amalgamations have taken place. I use this word "desirable" advisedly. *A properly financed and properly managed merger is desirable to all parties concerned.* It is helpful to the telephone subscribing public by increasing the scope, and value, of the service. Furthermore, its benefits to the subscriber (always assuming that such a merger is properly financed and well managed) by reducing overhead and operating costs—and therefore, in the long run, by either reducing rates or deferring the date at which increased rates must be asked for. This latter statement is predicated upon the assumption that the service rates in effect at the time of the merger are proper and adequate. Otherwise, of course, readjustments will have to be made and *these adjustments are just as essential to the welfare of the subscriber as they are to the owners of the property.* Rates that are too low are a *menace* to the subscriber—as they inevitably entail poor maintenance and *poor service.*

From the standpoint of the operating company, properly financed and well managed mergers have innumerable advantages—such, for instance, as the centralization of supplies and the reduced costs of handling such supplies; the reduction of maintenance and operating expenses; the reduction of supervisory and overhead charges, etc., etc.

During the year 1928 it is but natural to suppose that this process of amalgamation, and merging, of small units into larger units will continue—though probably to a lesser extent than that which prevailed during the year 1927. Nevertheless, it is interesting to note, and I have a number of inquiries on my desk right now from small Independent operators, who would like to find ways and means of "getting together" with others similarly interested—with a view to the formation of larger operating units, and with a view to securing the necessary capital to renovate their respective properties and extend the scope of their respective services.

So much for a review of the situation prevailing during the year 1927 and a brief forecast (based entirely upon the writer's own humble judgment—but backed by authentic data which he has at his disposal) of the "probabilities" for the year 1928.

### Valuing Properties

At the conclusion of the last article, a brief preface was given to the all important subject of determining the present condition of a telephone property. In the present article (and succeeding article), it is proposed to amplify this phase of the subject of "Valuing Telephone Properties" in a constructive and helpful manner—so that you, yourself, will be in a position to undertake a problem of this nature, at least in part, thus minimizing your expenditures for high priced engineering-valuation consulting service.

At this juncture, it is rather interesting to note some of the peculiar ideas advanced by supposedly well versed people on this subject of accrued depreciation, or present value. The writer knows of an instance where a company (having a property with a reproduction cost of over one hundred and fifty million dollars) used every precaution to insure the accuracy of the inventory; used extraordinary precautions in so building up the unit costs as to reflect actual present-day reproduction costs and then practically ignored the question of accrued depreciation.

This company referred to had a very extensive valuation department—in charge of a skilled and thoroughly trained engineer—and left no stone unturned (with respect to accuracy) in recording the inventory and building up the unit costs. Furthermore, the company—when it submitted its case before the commission—spent almost ten days in presenting expert testimony (said testimony being given by the engineer in charge of the valution

*Consulting Telephone Engineer, 448 Wrigley building, Chicago, Ill.

department) to prove how carefully the inventory and appraisal had been made. When it came to the question of present, or depreciated, value, however, this witness was forced to admit that no examination had been made in the field to determine the present condition (or the unexpired life) of the various component property elements. The witness offered the following testimony—which seems to the writer ridiculous. Witness said that he had called in general foremen, engineers and superintendents for a "round table conference" and they had talked over the general condition of the poles, wire, etc., etc., and *arbitrarily* assigned certain percentage values to these various accounts.

Quite naturally, even the company felt a little bit shaky about this method of procedure, and therefore it retained one of the best known and highest priced engineer's experts on the North American Continent, to go on the witness stand and swear that the foregoing method of procedure was "fair and reasonable."

It so happened that this consulting expert had previously always *insisted* upon a detailed, and most thorough, inspection of each and every pole; all of the aerial wire; all of the cable plant, etc., etc.—as being the *only* method of arriving at the true condition of the property. Draw your own conclusions as to the benefits (?) which may be derived from this very convenient method of determining the present value of a telephone property—be it a small property or a property worth a hundred and fifty million dollars.

I will say this, however: There are very few commissions who would evidence the patience shown by the commission in the case under discussion—and as a matter of fact, most commissions would not stand for more than thirty seconds of testimony of this nature. In fairness to the commission I am referring to, it may be well to add that I believe it listened to this foolish testimony largely from the standpoint of curiosity and to give the company a chance to "hang itself by its own rope." The final order shows, clearly that the commission was not "buncoed" into any serious consideration of this convenient short-cut method.

Before going further, in our detailed discussion of ways and means of arriving at present value, it may be well to consider briefly the distinction between annual depreciation and accrued depreciation, the latter being applicable to our present problem of determining the depreciated value of a telephone property at a certain inventory date.

Let us first consider what the word "depreciation" really means. The Century Dictionary defines depreciation as "a falling in value; a reduction in worth." The Standard Dictionary states, simply, that depreciation is "a lowering in worth." An excellent definition advanced by Dr. R. H. Whitten in his book, "Valuation of Public Service Corporation" is the following: "Depreciation can be defined as the lessened utility value caused by physical deterioration or lack of adaptation to function."

There are two prime causes of depreciation—physical depreciation and functional depreciation. Physical depreciation may be subdivided into two classifications—the depreciation resultant from wear and tear and the depreciation due to age and physical decay. Functional depreciation may also be divided into two subclassifications—the depreciation due to inadequacy and the depreciation caused by obsolescence.

Each of these four causes of depreciation is so important—from the standpoint of the evaluation of both industrial and utility properties—that we will consider them in some detail.

The term itself suggests the true meaning of wear and tear depreciation. In other words, wear and tear depreciation is that resultant, or caused by, every day use or wear. Strange as it may seem, wear and tear depreciation does not play so important a part in connection with utility properties as it does in connection with many industrial properties. With the exception of replaceable parts a utility plant is not "handled" much. The poles, cables, conduits and wires—for instance—are not subject to any vigorous mechanical use—as is the case in connection with the machinery used in industrial plants.

Depreciation due to age or physical decay. As the term suggests, this form of depreciation is that resultant from age

**Determination of Composite Depreciation Rate for Public Utility Property**

| Item. | Reproduction cost. | Salvage value, percnt. | Wearing value. | Life in years. | Depreciation per annum in percent of wearing value. | Depreciation in dollars per annum. | Composite depreciation in percent of reproducetion cost. |
|---|---|---|---|---|---|---|---|
| Buildings | $ 21,404 | 25.0 | $16,053 | 30 | 3.33 | $ 535 | .... |
| Right-of-way | 2,229 | .... | 2,229 | 25 | 4.00 | 89 | .... |
| Pole lines—city, rural and toll | 48,899 | .... | 48,899 | 14 | 7.14 | 3,491 | .... |
| Line wire—city, rural and toll | 16,922 | .... | 16,922 | 9 | 11.11 | 1,880 | .... |
| Drop wire—city and rural | 6,158 | .... | 6,158 | 6 | 16.66 | 1,026 | .... |
| Aerial cable and messenger | 14,862 | 25.0 | 11,147 | 12 | 8.33 | 929 | .... |
| Aerial cable terminals and fittings | 3,481 | .... | 3,481 | 8 | 12.50 | 435 | .... |
| Main conduit, manholes and paving | 7,798 | .... | 7,798 | 40 | 2.50 | 195 | .... |
| Subsidiary conduit | 2,035 | .... | 2,035 | 15 | 6.67 | 136 | .... |
| Underground cable—main | 3,771 | 35.0 | 2,451 | 20 | 5.00 | 123 | .... |
| Underground cable—subsidiary and C. O. terminating cable | 2,268 | 25.0 | 1,701 | 12 | 8.33 | 142 | .... |
| Underground cable terminals and fittings | 609 | .... | 609 | 8 | 12.50 | 76 | .... |
| Subscribers' station apparatus | 20,070 | .... | 20,070 | 9 | 11.11 | 2,230 | .... |
| Subscribers' station installations | 4,375 | .... | 4,375 | 8 | 12.50 | 547 | .... |
| Central office equipment | 19,656 | 18.0 | 16,118 | 10 | 10.00 | 1,612 | .... |
| General equipment | 3,601 | .... | 3,601 | 5 | 20.00 | 720 | .... |
| Total | $178,138 | .... | ..... | .. | .... | $14,166 | 7.95 |
| Incidentals, omissions and contingencies | $ 5,846 | .... | ..... | .. | .... | ..... | .... |
| Warehouse and purchasing expense | 5,460 | .... | ..... | .. | .... | ..... | .... |
| Tools and tool expense | 2,059 | .... | ..... | .. | .... | ..... | .... |
| Total | $ 13,365 | .... | ..... | .. | .... | $ 1,063 | 7.95 |
| Total collateral construction costs | $ 34,360 | .... | ..... | .. | .... | ..... | .... |
| Land, material and supplies | $ 8,614 | .... | ..... | .. | .... | ..... | .... |
| Grand total | $234,477 | .... | ..... | .. | ..... | $17,961 | 7.66 |

and natural deterioration. It plays a most important part in connection with public utility properties. Poles decay and become worn out and have to be replaced; iron wires become corroded and have to be replaced and, to a lesser extent, the depreciation resultant from age and physical decay affect aerial cables, underground cables, and even telephone switchboards and subscribers' station equipment.

**Functional Depreciation.**

We have now considered the two forms of physical depreciation. Functional depreciation—depreciation resultant from inadequacy and obsolescence—also plays a most important part in connection with the evaluation of utility properties. This is especially true in connection with central station equipment. A switchboard may become "inadequate" to fulfill the requirements imposed upon it. Circumstances may be such that the board in question cannot be supplmented by adding additional similar facilities. It therefore has to be replaced by a new board—of larger capacity—and the "lowering in worth" or reduction in value is entirely due to the inadequacy form of depreciation.

Also, in the case of the outside plant, it frequently happens that aerial cables, and underground cables, have to be retired from active service due to "inadequacy."

Mr. Henry Floy has given an excellent definition of obsolescence depreciation in his book, "Valuation of Public Utility Properties." Mr. Floy says, "obsolescence mean the depreciation of a property through the development of something newer, either more economical or more of a fad. Like inadequacy, it may necessitate the abandonment of property long before it is worn out (from physical depreciation) and in many cases it arises directly from the demands of the public. What is obsolete in one place may not be affected by obsolescence in another. Note, for example, the introduction of the 'pay as you enter' cars in the larger cities, or the use of 'open bench' cars in the Borough of Bronx (New York City), where they are considered good practice, while at the same time they (the open bench cars) are considered obsolete for use in the Borough of Manhatttan—all within the boundaries of New York City."

Insofar as telephone equipment is concerned—central office and subscribers' station apparatus—the art of telephony has progressed to a point where it is rarely necessary to make replacements because of obsolescence. A possible exception to this statement may be found in the substitution of automatic, and machine switching systems for manual systems.

It is also true that, in connection with the outside plant, changes are necessitated by obsolescence. Take, for instance, the case of a utility company maintaining pole lines and open wires in the congested section of towns and cities. Frequently such pole lines and wires have to be replaced by underground plant—because of the requirements imposed by municipal ordinances. The pole lines and wires, in question, may be in good physical condition and in this case the depreciation or "lessening in value" would be due entirely to obsolescence.

So summarize—it may be said that, in the case of public utility properties, depreciation resultant from age or physical decay is the most important factor to be considered. Next, in order of importance, is the depreciation due to inadequacy; third (in order of importance) is the depreciation due to wear and tear and fourth, the depreciation due to obsolescence.

There is still another cause of depreciation which has a very real bearing upon some utility properties. In many of the smaller telephone plants the major portion of the construction is of the aerial type—and therefore especially susceptible to damage from sleet, snow and wind storms. A short time ago almost the entire telephone plant in one Mid-Western town was destroyed by a heavy sleet storm, followed by a wind storm. Again, large fires—such as the San Francisco and Baltimore fires—sometimes work great havoc in the aerial portion of a public utility company's plant.

**Extraordinary Depreciation**

All of the depreciation resultant from these unusual causes—fire, storms, etc.—is grouped together in utility accounting practice, and is known by the peculiarly descriptive term of "extraordinary" depreciation.

There are two ways in which depreciation affects our present problem. Depreciation must be considered from an accounting standpoint and it is a most important factor in determining present worth.

To offset the ravages caused by depreciation, a fund must be set aside each year to replace plant at the end of its useful life. In other words, average lives and salvage values must be determined for each classification of plant, and proper rates of depreciation determined. To illustrate, let us assume that a certain unit of plant has a replacement cost of $100.00 and a salvage value of $10.00. We may further assume that the average life of plant of the type under consideration is 10 years. Hence, the difference between the replacement cost, $100.00, and the salvage value, $10.00, will have to be made good through the medium of the reserve fund for depreciation. The monetary amount involved in the case cited is $90.00, and this is known as the "wearing value" of the unit in question. A means will have to be devised to provide a fund of $90.00 by the time the plant is retired from active service. This $90.00 when added to the $10.00 salvage value will give the $100.00 necessary for replacing the plant.

What is known as the "straight line method" is generally adopted for building up a depreciation reserve fund. In carrying out this method—in the case under illustration—we divide the $90.00 wearing value by the ten-year life—which gives us an amount of $9.00 to be set aside each year in the reserve for depreciation.

Land, of course, is not depreciable, but nearly every other item of public utility property is depreciable. The usual method of determining the amount to be set aside each year is illustrated in Fig. 8. It will be noted that the various classifications of plant, according to the interstate System of Accounts, are listed in the first column. The first item is buildings; the second, right of way; the third, pole lines, etc. In the second column the corresponding reproduction costs are given, and in the third column the salvage value (in percentage) is given. The fourth column of the table is entitled "Wearing Value" and the respective figures are obtained by applying the reciprocals of the salvage values to the corresponding reproduction costs. To illustrate, the reproduction cost of the buildings is $21,404.00 and the salvage value is 25 per cent. This gives the wearing value in terms of per cent of 75, and this percentage applied to the reproduction cost gives the wearing value in dollars of $16,053.00. The fifth column of the table gives the average life in years of the various component elements of plant, and the sixth column gives the depreciation per annum in terms of percentage of the wearing value. These percentages are, of course, the reciprocals of the corresponding figures given in the fifth column. The percentages as given in the sixth column are applied directly to the wearing values as given in the fourth column—the result being the depreciation in dollars per annum, as given in the seventh column of the table.

For purposes of general information, an eighth column has been included in the table, entitled "Composite Depreciation in Per Cent of Reproduction Cost." Composite depreciation rates are determined by dividing the amount in dollars of annual depreciation by the corresponding reproduction costs. To illustrate, a total of $14,166.00 (representing the total annual depreciation of the physical property) divided by the corresponding total reproduction cost, $178,138.00, results in the composite depreciation rate of 7.95 per cent. The final composite depreciation rate, in this case, is 7.66 per cent. In this connection, it may be said that a depreciation rate of from 7 to 8 per cent—the exact amount being dependent upon the exigencies of the case at hand—is customary for telephone properties.

Aside from its relation to the account-

ing phase of our problem—depreciation plays a most important part in the determination of the value of any public utility property. We must guard against confusing depreciation as considered in connection with building up the reserve fund of a property. These problems are entirely separate, and are not interrelated in any way—except insofar as the determination of average lives and salvage values is concerned. Professor Earl A. Saliers of Yale University, in the preface of his "Prinicples of Depreciation," says:

"The depreciation problem may be viewed from two standpoints, that of the accountant and that of the engineer. The engineer with physical conditions, such as steady plant deterioration, the necessity of replacement, etc. The accountant devises the ways and means of recording in the most intelligent manner the facts in connection with the changes. The work of the two should be correlated through a common understanding of the character and the extent of depreciation. The engineer having shown what the rate of depreciation is, the accountant suggests devices for recording it, for providing replacement funds, etc., and this for the presentation of capital values."

In an article published in the "New York Journal of Accountancy," several years ago, Mr. John J. Thomas said:

"A correct understanding of the function of the accountant and that of the engineer as it relates to valuation and depreciation is the first step toward correlating the work of the two and harmonizing two entirely different but equally logical points of view. One covers protection against loss through the property's damage or destruction; the other protects the financial solvency of the concern by anticipating additional depreciation likely to occur through probable improvements in machinery and methods, based upon experience in any particular line of endeavor.

"The appraisal engineer has the task of measuring the amount of depreciation due to wear, tear and obsolescence that has actually taken place. The accountant's duty is to add to the percentage of depreciation annually occurring a percentage sufficient to provide a reserve fund for future contingencies, and the gradual replacement of the property. It is often larger than necessary to be safe.

"If this fundamental difference is kept in mind, there will be no feeling on the part of the engineer that the accountant is 'depreciating' the plant values excessively; nor will the accountant on the other hand view the depreciation made by the appraiser as closely inadequate.

"Putting the proposition in a mathematical form, let 'x' equal the amount of actual depreciation that has taken place, 'y' equal the amount of increase to provide a reserve fund for future contingencies and replacement. The function of the appraiser is to ascertain the value of 'x' and determine why 'y' should be. Manifestly, if the appraiser terms 'x' the actual depreciation, and the accountant declares that 'x' plus 'y' is the actual depreciation, they will never agree. This shows that there should be a careful study that would lead to a mutual understanding of each other's views of depreciation, so that when one says, 'This is the actual depreciation,' it will mean the same thing to both. It will also be observed by this formula that the accountant is dependent upon the appraiser in order to know the amount of 'x'."

The claim is sometimes made that the plant has depreciated to an amount represented by the balance to the credit of the renewal fund. Mr. Thomas shows, however, that engineers are, for the most part, following the practice of using so-called standard tables in estimating depreciation, and making deductions in proportion to the age of the plant. To quote further:

"The establishment of renewal funds through 'depreciation' annuities can be likened to the accumulation of a fire insurance fund on a building. A building that has not yet burned has certainly lost none of its value by reason of a fire-insurance fund existing to insure it; neither has a plant lost value because of a renewal fund that exists to insure its gradual or final replacement. On the contrary, the fact that such a renewal reserve is being maintained is the stringent argument that all that is possible is being done to provide against impairment of investment and impairment of efficiency.

"It is obvious that the renewal fund will accumulate faster than is really necessary in the earlier years of a plant's history, because the replacements during the earlier years will be comparatively few; but that after a number of years the expenditures for replacements and the contributions to the funds will somewhat more nearly balance each other.

"It is evident that the percentage of depreciation that would show the present value should be a different amount from the percentage used to establish a renewal fund. Some authorities call the latter 'theoretical depreciation.' It might better be termed 'safety-first depreciation.'

"On the other hand, it is as wrong to take only the actual depreciation and say that it is a sufficient amount to provide for replacement. Actual depreciation is an impairment of capital, while the additional depreciation is a provision to preserve capital intact. Some authorities hold that it makes no difference, and that the appraisal engineer is not interested in the purpose for which the valuation is to be used. So far as ascertaining the reproduction value is concerned, this is true; but it does not apply to the percentages that are deducted from the reproduction value. In other words, the expert should know for what purpose his depreciation figures are to be used, and the depreciated value should state what it intends to show. This does not affect 'the basic value of new replacement'."

Certain peculiar conditions arise in figuring the actual depreciation. The example used by Mr. Thomas is the calulation of the sales value of a property to be removed and used elsewhere. As an example, he cites the removal of a special machine to some other place in connection with some use other than that for which it has been installed. This removal might necessitate such a large expenditure for modification of design so that it might be useful, that it would have little value after the expense was paid. The machine's sales value, therefore, would necessitate a large percentage of deduction from its value to a going concern in its original place. The heavy percentage of depreciation would necessarily be absurdly large. It follows, therefore, that if these different deductions are termed depreciation, correct estimates for one purpose may be incorrect or inadequate when applied elsewhere.

To maintain the plant in efficient condition through repairs and minor renewals paid from current income, Mr. Thomas believes, is a wise procedure. The final renewals are made as required, and the cost is debited to the renewal reserve account. When renewals are made and the reserve account is debited because of liability for future renewals, it is important that the expenditure therefore should be charged against "Renewal Reserve Account" and not against the year's operating expense, otherwise the reserve would be building up indefinitely. Mr. Thomas gives the following points, which should be kept constantly in mind in studying the problem of depreciation:

(*Continued in February issue.*)

## Arkansas Meets at Little Rock, Jan. 16-17

Little Rock, Ark.—Headquarters of the annual meeting of the Arkansas Telephone Association to be held on January 16 and 17, has been changed to the Hotel Gleason instead of the Hotel Marion.

An interesting program has been arranged for the two days and a large attendance is expected both in members throughout the state and neighboring states as well as manufacturers.

Owing to the South's industrial progress the southern states are coming into their own. So much attention has been given to the South's cotton manufacturing in recent years that many overlook the great expansion in diversification.

# Telephone Antiques Are Menaces in Service

By RAY BLAIN

Independent telephone companies are as a rule progressive and make an honest effort to keep their plants as near up-to-date as conditions and their resources will permit. Of course there never was a rule without its exception and some are so far behind the times that they are hopelessly lost in the jungle of antiquity.

A very good example of this was recently brought to my attention by an accident which occurred down in that state that proudly boasts of being the home of presidents, and if pressed will admit that it is also the home of the Anti-Saloon League. But regardless of what they are the home of, they usually have mighty good telephone service and the majority of the exchanges are strictly modern. However, in the exchange where the accident occurred they are still making use of a type of telephone that must have been obsolete about the time Teddy Roosevelt charged up San Juan hill. The heavy transmitter and ringer movement was mounted on the door of the box which was hinged at the bottom and held in place by a small machine screw at the top. When this screw was released and the door shoved out slightly the balance was lost and it comes down with a terrible bang and swings like a pendulum for several seconds to the tune of its creaky hinges. On numerous occasions I understand that unsuspecting trouble shooters have been knocked cold and we all know that it takes quite a hard jolt on the head to knock out a trouble shooter or lineman. In the old days I have on numerous occasions seen a few stand up and never bat an eye after a pair of eleven inch connectors had been applied with the intent of being an instrument of destruction.

On this particular antique the set had been opened so much that the threads had about all been worn from the machine screw which made it no longer effective. A lady placed a long distance call from this instrument which was installed in a local hotel room and when advised by the operator that her party was on the line twenty miles distant started to talk and tried to make the party on the other end of the line understand. This young lady was so short of stature that even when standing on tip toe, she was unable to shout directly into the poor old packed transmitter as was required for even passable transmission. It is very hard to shout when standing on tip-toe unless one is a toe dancer, so the young lady reached up and tried to pull the transmitter down to a more favorable slant to catch the sound waves. This was just a little too much for the poor old worn out machine screw which suddenly gave up the ghost and the door came down like a deadfall with a terrible clatter, the transmitter striking the young lady in the mouth and knocking off a part of one front tooth and marring her appearance in general.

In a case like this even a refined young lady can be excused for uttering strong language, and in this instance I understand that a sailor's parrot would have been put to shame and that several new words were coined. After a few days the young lady's features gradually resumed their former loveliness and an obliging dentist repaired the broken tooth with a beautiful gold inlay to the tune of ten dollars.

The hotel manager was very sorry that the accident occurred but promptly denied all liability as the telephone company owned and maintained all equipment in the building. A letter was then written to the manager of the telephone company explaining the accident and stating that if the company would pay for the repair of the tooth that the young lady would forget her mental anguish and physical suffering. The manager came back with a "Simon Legree" letter stating that the instrument in question had been examined and although the threads had been stripped from the holding screw, that the door in closing was found to bind in such a manner on the sides of the instrument that it would remain closed under an ordinary pull, in other words, this ninety-five pound girl had exerted brutal strength or the accident would not have happened. It was then further explained to the manager that equipment of this nature was just as much a hazard to public safety as though a pole had broken off and permitted a cable to sag in the street low enough to catch a passing automobile. But even after this he refused to pay any dental bills.

### Safety Guards for Patrons

I am of the opinion that if a telephone company is not progressive enough to replace subsets that black eyes, skin noses, and knock out teeth, it should at least be considerate enough of public safety to provide catcher's masks, chest protectors, shin-guards and a first aid kit for each pugilistic instrument in service. It might be a good idea to refer this to the humane society after they have finished with Lindy's bull fight.

Now just a serious thought in closing. It is a peculiar fact that many telephone companies that keep their main exchanges up-to-date will completely ignore their private branch exchange substation equipment. This seems to be particularly true of most hotel stations and it is a safe bet that the oldest instruments in service on any system will be found in some of the hotel rooms. It is true also that the average instrument in a hotel room is used very little outside of house calls. But at present, with the new low long distance night rates in effect, this condition is being rapidly changed. These low rates make it a common practice for the traveling salesman to call the home office at night. Others while traveling will take advantage of these rates to call the home folks and the phone in the hotel room is the more convenient and the most used for this purpose.

There was a time when most long distance calls were placed from a booth in the lobby, but this practice is in most localities being discontinued by parties who are guests of the hotel. This seems to make it necessary that a substation inspection of PBX stations be conducted just as frequent as the inspections on main exchange stations since it is just as important that they operate efficiently in a modern telephone system.

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### Lane Quits Bell to Head Southwest

Little Rock, Ark.—S. A. Lane, division manager of the Southwestern Bell Telo. Co. has resigned to become president of the Southwest Telo. Co. He is succeeded in the Southwestern by W. E. Gosdin.

Mr. Lane was active in organizing the Southwest Telo. Co., merging a number of Independent companies in Arkansas and adjoining states. He is highly regarded as one of the state's constructive business men.

Mr. Gosdin was connecting company agent for the Southwestern at Dallas prior to his transfer to Little Rock.

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Tecumseh, Okla.—Southwest Telo. Co., Little Rock, Ark., has bought local plant from M. S. Kirkpatrick.

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Mobile, Ala.—C. W. Banks has bought Midway Telo. Co.

# LINE AND DESK

## THE SAME OLD STORY; CARELESSNESS

The following review in Southern Telephone News of a number of recent accidents tells the same old story of accidents that might have been avoided if sufficient care had been exercised:

(1) "I was pulling twisted pair wire out of rings when end of wire punctured middle finger of right hand between joint and first knuckle. The following day my finger became inflamed and infection set up."

This man did not think to cut the ragged bare end of the wire off before he started to pull it out of the rings. This simple precaution would have prevented this accident and his failure to cover the wound with a clean dressing added to the danger of infection.

(2) "I was stung on the arm about 1 p. m. Looked to see what stung me, but it was gone. Put iodine on sting and didn't think there was anything to it until the following morning when it was swollen and a red streak running up my arm."

The sting it seems was unavoidable, but proper first aid was not applied and indifference as to the result made it necessary for him to suffer pain and be compelled to go to a physician for treatment. Think this over and learn to render proper first aid.

(3) "Old pole was off at ground line and a pike pole was placed on each side to support it. The butt was then moved in proper line which caused one of the pikes to cut out and fall. It hit me on the forehead, causing a slight bruise; also a small cut on the nose."

This was a man with long experience who knew the danger in what he did but failed to think. Under the conditions a man should have attended each pike while butt of pole was being moved or the safe way would have been for him to put his guy lines on it before moving the butt.

(4) "I was climbing stepped pole and almost reached the terminal, about 14 feet from the ground, when my right foot slipped off pole step, causing my body to fall against iron step which struck my chest on lower right side."

As the pole steps were in good shape and the man gave no reason for his foot slipping, the accident can be attributed only to carelessness. It was at the beginning of the day's work and his mind was not on his job. For safety always think about what you are doing.

(5) "I was standing on second arm and untying No. 19 wire with pliers. When tie wire broke my pliers flipped up and hit me on the lip."

For safety this man had his face too close to his work and was evidently pulling the tie wire instead of turning it off with his pliers.

## PRIVATE WIRE SERVICE AN IMPORTANT BY-PRODUCT

Private wires are almost indispensable to financial houses such as banks, stock brokers, investment and bond dealers, says J. J. Sheldon in a recent article in "Long Lines." Industrial concerns such as manufacturers, merchants, packers' insurance companies, are also growing users of private wire service which is furnished as a by-product to the regular message service over the long distance lines of the Bell System. Five classes of service are offered where and when facilities are available. These are as follows:

Telegraph or Morse Service consists of telegraph line facilities between two or more cities terminated in a set of telegraph instruments in each of the patron's offices specified in the contract.

Service is furnished for continuous periods of time during the day or the night hours or for twenty-four hours. Service falling in this latter period, of course, is largely confined to our press customers or to the United States government, whose needs for service are not confined to the normal business hours of the day. It is our opinion that twenty-four-hour service will become commercialized as manufacturing companies can be shown the advantages of this continuous communication.

"Single" service provides for transmission in one direction at a time. "Duplex" service provides for simultaneous transmission in opposite directions. The line charge for duplex service is twenty-five per cent higher than the charge for single service.

Full talking service. This is a telephone service provided for the exclusive use of the patron between two or more cities and terminated over a direct loop from L.D. to the switchboard or instrument located in the patron's office. This type of service is furnished during the day from 8 a. m. to 6 p. m. and during the night from 6 p. m. to 8 a. m. or for continuous service twenty-four hours daily.

Telephone typewriter service. This service is furnished by means of telegraph line facilities terminated in telephone typewriter machines which we install in each of the patron's offices. A description of telephone typewriter service appeared in the November "Long Lines."

Short period talking service. This service is furnished over telephone line facilities terminated, over a special loop from L.D., in a switchboard or instrument in the patron's offices. The minimum period of service offered is ten minutes per day, five days per week during the hours between 8 a. m. and 6 p. m. During the night, between 6 p. m. and 8 a. m. the minimum period offered is thirty minutes per day, five days per week with the exception that service is offered to press patrons for one night only per week.

Public news telephone service. This type of service is offered to the press only and is furnished over telephone line facilities, terminated over a special loop from L.D., in a P.N.T. set which is installed in each of the offices specified in the contract. The minimum period of service offered is fifteen minutes daily which can be taken in one, two or three periods of five-minute multiples. Not more than three periods are allowed on one service. The P.N.T. set consists of a desk telephone set mounted on an extension arm, double head receivers and a foot-operated transmitter cutout. This equipment is furnished in connection with this class of service because of the nature of the patron's requirements.

## CREOSOTED DOUGLAS FIR POLES IN CALIFORNIA

Creosoted Douglas fir poles are becoming popular in California according to "Wood Preserving News," which gives the following explanation:

"For many years the pole-using utilities in California noticed the life of many of their poles brought to a sudden and unexpected end, explained by the foremen as 'worm eaten,' and it is only during the last few years it has become known that these 'worms' are the dreaded termite, or white ant.

"California is favored with some eight species of termites, some being of the

subterranean variety, others of the non-subterranean, with the result that both the butt portion of the pole and the section above ground are attacked and in many cases destroyed. Since the entire pole requires protection, therefore, the only solution is the use of poles creosoted their full length under pressure. In a number of cases where non-pressure treated poles were used it was found that checks which sometimes opened after treatment allowed entrance of the termites into the portion of the wood not penetrated by the preservative. The pressure-treated poles are thus thoroughly protected from termites as well as from decay.

"The Douglas fir pole has many qualities which make it an ideal pole to meet this situation. For many years treated Douglas fir has been used as piling for wharfs, trestles and other structures, and the treating plants have adapted their methods of treatment to produce a product which entirely meets the requirements of pole line construction, with the result that during the past three years some 25,000 creosoted Douglas fir poles have been installed in California."

## WHY NOT MORE TECHNICAL INFORMATION?

Referring to remarks made by Mr. A. M. Benedict at the Missouri convention, reported in our December number, we have the following interesting and suggestive letter from W. V. Sylvester, who has charge of the telephone system of the city light and power department of Seattle, Wash.:

"Mr. Benedict says the worst thing he has to contend with is the dearth of competent help. He goes on to say they don't know anything. Which leads me to ask the question, 'Do any of us?' I take care of the telephone system of a fairly large power concern. I don't have to make it pay like many poor harassed telephone men, but I do have to make it work and keep working under the most adverse conditions. The worst thing I have to contend with is the amazing lack of data on telephone apparatus. How many milliamperes should a certain ringer take at a certain voltage and frequency? What is the exciting current of a repeating coil at a given frequency and voltage? What is the output of a telephone generator at hand speed?

"These are only a few of the questions the answers to which I failed to find any answer for in telephone literature. And I have studied both books and catalogues. Why can't the manufacturers rate their equipment in fixed units instead of telling us it is better than the other fellows. It is an insult to our intelligence to tell us we couldn't understand and any other reason is an evasion of the question.

"I have been in the telephone business long enough to know that a good guesser makes a good bughunter. But I also know that a little definite knowledge beats all the guessing we can do. My employers are progressive enough to supply me with a few meters and other equipment. So I am going to get the answer to some of these questions. But I can't possibly cover the whole field.

"Why in heck can't some of the larger Independent associations establish a research department and get for themselves some of this information that Mr. Bell knows so thoroughly and guards so carefully. The pro rata cost would be small and the dividends would be large. Also if enough of us holler, and holler loud enough, the manufacturers will dole out a little information from their archives.

"Hoping this will strike a responsive chord in the hearts of my technical contemporaries, etc."

## WIRE NETTING IS BANQUET FOR WOODPECKER

Editor TELEPHONE ENGINEER:

I see in your December issue an article from an exchange in regard to woodpeckers and telephone poles. The writer states that the creosoted poles were immune from their attacks. This might be true in some localities, but doesn't apply to Arkansas and Louisiana. I have several places where they have practically eaten up creosoted poles.

Some years ago I wrote an article telling how we had wrapped some 80-foot river crossing poles with galvanized screen wire, and believed we had them bested. But I boasted too soon. Evidently didn't know Mr. Woodpecker, for he has since then eaten holes through the wire and made a nest in those same poles. That same crossing has to be replaced soon.

We are still trying to outwit Mr. Woodpecker.—J. P. Whitson, Arkansas Natural Gas Co.

## REMEMBER IN TIME—IT PREVENTS INJURY

Hello, Bill! Huh? Why am I so happy? Say—I just avoided a "lost time accident." How come? Well, you remember that poster on the bulletin boards a short time ago—about being careful never to hold an article in the palm of your hand while working on it with a screwdriver.

Well, today I was fixing the plug of an extension cord. Ordinarily it is very easy to turn these screws, and I had acquired the habit of holding the plug in my hand while working on it. But the screws in this plug were tight and rusty and didn't turn willingly; naturally, I gradually increased the pressure on the screwdriver—when suddenly I recalled the caution on the bulletin board, concerning just such cases.

I quickly placed the plug on a table and with the same pressure attempted to turn the screw, when WHANG! The edge of the groove in the screw gave way, letting the screwdriver slip—oh boy! you should have seen the chunk of wood it took out of the table! And am I joyful that the chunk was out of the table instead of out of my hand! So, Bill, let that be a lesson to you! Remember, it's easier to replace a chunk of wood than a piece of your hide.

So long, Bill.—G. F. Ebert in Bell Telephone News.

## FOUNDATIONS OF SATISFACTORY SERVICE

The operation of any telephone property contemplates the furnishing of satisfactory telephone service to the subscriber. To do this the plant must be in good condition and the organization must function properly. Given these requisites, a number of specific tasks confront the operating organization, some of which may be enumerated as follows:

1. Installations, moves and changes promptly made.

2. The work of such changes quickly and well done by workmen who are neat in appearance and courteous to the subscriber.

3. Information records promptly posted and correct information speedily and courteously given.

4. Directory listings absolutely accurate and the directory clear and readable, and kept up-to-date.

5. Accurate bills for service rendered regularly.

6. Accounts collected regularly and courteously.

7. The telephone service furnished accurate, swift, uniform, reliable and without discourtesy.

8. Service interruptions few in number and promptly cared for.

9. Repairs speedily made in a workmanlike manner.

10. The actual transmission of speech as nearly perfect as is possible with modern equipment.

11. Traffic loads continuously engineered to insure adequate trunking and even loading without idle equipment.

12. The plant kept in such condition as regards reserve equipment that spare facilities are always available.

13. The subscriber kept thoroughly sold at all times on the aims and policies of the company.

14. The plant maintained in a high grade of condition.

15. All complaints from subscribers

# Who are these Investors?

*An Advertisement of the*
*American Telephone and Telegraph Company*

TEN years ago fifteen of the largest corporations in the United States had a total of approximately 500,000 stockholders. Today the American Telephone and Telegraph Company alone has more than 420,000 stockholders.

This is an instance of the amazing growth of saving and investment that has taken place in this country.

Who are these new investors?

American Telephone and Telegraph stockholders come from every rank and file in every state, nearly every town and city, in the land. Mechanics and merchants, teachers and bankers, laborers and lawyers—every station of life is represented in this investment democracy. And it is a democracy, for the average holding is only 26 shares. No one person owns as much as 1% of the total stock.

The American Telephone and Telegraph Company and its associated companies comprising the national Bell Telephone System are owned by the people they serve.

given the utmost consideration and adjustments promptly and fairly made.

16. Accurate records of all conditions affecting the property maintained by the plant, traffic and commercial departments.

A multitude of other minor tasks will present themselves, but these sixteen points of telephone operation must be closely followed by the telephone operating company if it is to achieve success in the operating field, whether the type of equipment be manual or automatic.—F. E. Bohn in Automatic Telephone.

## PENNSYLVANIA HAS BIGGEST RAILROAD PLANT

The new Pennsylvania railroad produce terminal in Philadelphia, the world's largest and most modern railroad plant, is equipped with a two-position, non-multiple switchboard, with fifteen trunks and eight tie lines, seventy-five stations and sixty-five coin box stations. Of the pay telephone stations, forty-one are in booths and the remaining twenty-four are in special boxes on the delivery yard platforms where space would not permit the use of booths.

## TRANSATLANTIC RADIO UNITS EVADE STATIC

It was Mr. Static that was responsible for the location of the transatlantic radio telephone receiving station in the state of Maine rather than in the vicinity of New York City. Maine was not selected, however, until careful investigations had been made, the result of which led to the establishment of the station at Houlton in that state. It was found that in Maine the severity of static was much less than near New York and that most of what there was came from the southwest, whereas the signals from England come from the northeast.

It was likewise this same Mr. Static that recently caused the British Post Office engineers to establish their new receiving station at Cupar near Dundee, Scotland, where the most modern developments in wave antenna systems have been put into service to block out the static which comes from southern Europe and tropical Africa.

The result of establishing the receiving station in northern Maine rather than in New York resulted in an improvement in static conditions which is equivalent to increasing the transmitter power fifty times.—Bell Telephone News.

## Otto Bernz Co. Gives Details of 1928 Line

Newark, N. J.—Otto Bernz Co., Inc., in announcing its 1928 line names as torches Bernz will manufacture and catalog, Nos. 6, 6-C, 9, 10, 30, Banjo 31, 79, 80, 82, 83, 84, 87, and 88.

The No. 6-C torch is the same as No. 6 flat torch, except that it is for gasoline use only. The No. 6 torch is for gasoline-kerosene. The No. 30 is a self-blowing alcohol torch, and takes the place of the No. 13 torch which has been discontinued.

Torches Bernz will discontinue manufacturing are Nos. 12, 57, 58, 65, 66, 85 and 86.

In place of the No. 57 and No. 58, Bernz offers the No. 83 and No. 84. In place of the No. 85 and No. 86. Bernz offers the No. 87 and No. 88. The No. 65 and No. 66 torches have been discontinued on account of the limited demand. In their place Bernz offers either the No. 83 and No. 84, which are slightly lower in price, or the No. 79 and No. 80, which are slightly higher in price.

Bernz shall continue to manufacture special style torches and furnaces whenever they are required.

Furnaces Bernz shall manufacture and catalog are Nos. 19, 20, 21, 22, 23, 24, 30, 31, 32, 60, and 70.

The No. 30, No. 31, and No. 32 furnaces take the place of the "B," "B" tinners,' and "B" telephone furnaces, which have been discontinued.

## Wolman Salts, European Preservative, Now in U. S.

Chicago, Ill.—A comparatively new preservative known as Wolman Salts, named after Karl H. Wolman, who evolved the chemical mixtures in central Europe about twenty years ago, is now made available in this country through the American Lumber & Treating Corporation, 1138 Lake Shore Drive, Chicago. This preservative is highly toxic as it is composed principally of sodium fluoride and nitrated phenols to which are added a fixing mordant and non-corrosive elements. It is claimed to be odorless, leaving the treated lumber and poles clean with all of the original characteristics of the untreated wood and in such condition that the Wolmanized material can also be painted or stained.

The Wolmanizing treatment is said to add about twenty-one pounds of weight per thousand feet board measure. Treating plant facilities are so located as to be able to Wolmanize material in transit from point of origin to almost any point in the United States.

Extensive installations of Wolmanized lumber and poles have been made in the industrial fields of Central Europe, Central America, South America and more recently in this country where its use is becoming general as roofing for paper and textile mills and has been used in the extensive planking of the Coney Island and Rockaway Beach boardwalks, the seaside playgrounds of New York City.

The leading utility companies of Germany have been using Wolmanized poles for many years, the Brunswick Power Transmission Corporation having used this class of poles exclusively for 14 years. It is claimed that these poles may be painted if desired, add to the efficiency of linement, and as treatment is applied only under vacuum and pressure to the full length of the pole it is given protection which will make it last indefinitely.

The Wolmanized poles which the Standard Fruit & Steamship Co., of New Orleans, has installed extensively in Honduras are said to be giving satisfaction even though the tropical conditions present the severest known conditions for decay and termite destruction.

## Minnesota Convention at Minneapolis, Jan. 24-26

Minneapolis, Minn.—The Minnesota Telephone Association's 19th annual convention will be held in Minneapolis on January 24, 25 and 26, at the Radisson Hotel. All exhibits will be on the fourth floor.

A number of advance reservations have already been made by some of the representatives of the manufacturers and jobbers.

With the prospects before the association for a very busy season in the year 1928, and the contemplated extensions to existing properties, Minnesota says J. C. Crowley, state association secretary, offers to the manufacturers and jobbers of the telephone industry one of the most fertile fields for new business during the coming year.

**Steel Hotel Sets**

**Monarch Electric Co. steel hotel sets, 1000 ohm ringers, refinished ..... $5.00**

**Stromberg-Carlson steel hotel sets with adjustable transmitter arms, refinished ..... 5.00**

**American Electric Co. steel hotel sets ..... 3.50**

**BUCKEYE TELEPHONE & SUPPLY CO**

**Columbus Ohio**

# *How Michigan Bell Prevents Accidents**

By CHARLES E. GARDNER
*Superintendent, Department of Safety, Michigan Bell Telephone Co.*

For years before the war, accident prevention was the fundamental consideration of the management of the Michigan Bell Telephone Co. through supplying safe tools, materials, and adequate supervision in the performance of work. However, the increase in our personnel made necessary by the demand for increased service in all field of business, confronted us with the problem of training new employes in safe methods of doing our work. To accomplish this a series of safety meetings were held in which talks were delivered based upon slides showing accidents occurring to employes engaged in similar lines of work. To supplement this, payroll stuffers were used to call attention to various phases of accident prevention.

### Foreman's "Dope Sheet"

In addition to first aid training, another accident prevention feature which assisted us was the decision that responsibility for accident prevention should be delegated to authority for production and, to stimulate interest and to disseminate information regarding competitive standing, the "Foremen's Dope Sheet" was evolved. This showed, opposite each foreman's name, the number of months which had passed without an accident to any member of his crew.

To set up an objective to "shoot at," each division was requested to make an estimate in the nature of a "bogey." This placed responsibility directly up to them and was a reminder of their obligation toward their fellow-employes in averting accidents. The results of this estimate were set up on a chart, and each month the current accidents were posted opposite the "bogey" and enabled all employes to see the results of the contest. Large banners to display on the trucks were also awarded and they proclaimed that this group was a "Banner" or "No Accident Crew."

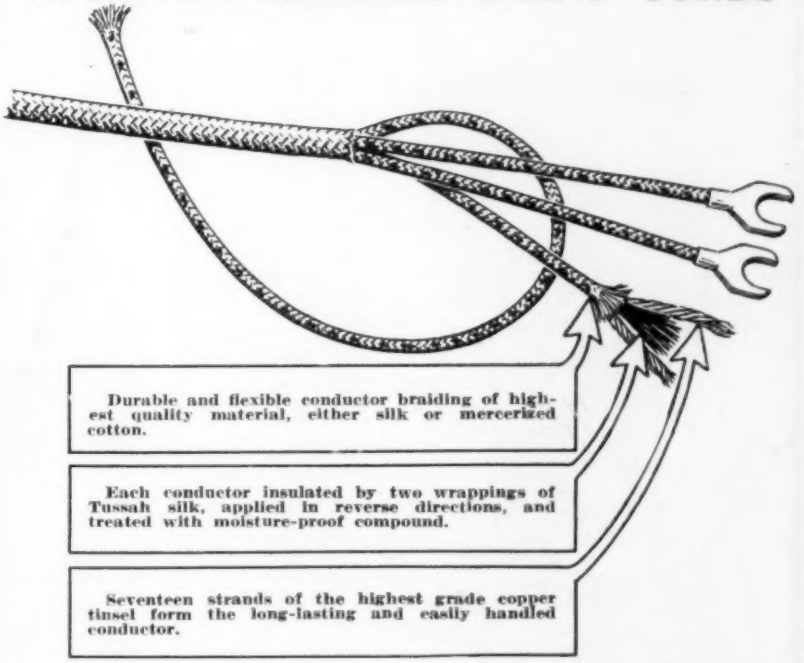
As a step on the part of the employes in fulfilling their part in the co-operative plan, it was thought that if the accident prevention experiences of all could be collected, this would enable every one to profit; and to obtain material for a proposed safety code, questionnaires were sent out to all plant employes urging them to give descriptions of accidents which had come to their attention and recommendations for avoiding similar ones.

As the questionnaires returned, they were edited by a committee appointed by the Employes' Association and finally evolved into a safety code. It is the result of the efforts of employes working in conjunction with management and is an example of what can be accomplished by everyone working together.

The interest shown by the men interviewed at stockrooms regarding a new type of accident, which resulted in injury to one of our men, prompted the thought that perhaps the periodical posting of a list of significant accidents on the bulletin boards would react favorably in enabling others to profit by them. The summaries are mimeographed on colored paper, a different color being used each time, and a heading is provided which is a terse comment on accident prevention written as though coming from the boss. This is used to compel attention, while a free use of slang is made in comment on each item to secure a reading by the employes and stimulate discussion. Illustrated bulletins are also used and beneficial results are found to follow the prompt removal of old bulletins so that the boards are vacant part of the time. By this method new material secures notice by its presence.

*Courtesy National Safety Council.

Solve your cord problems
*by using*
RUNZEL-LENZ
MOISTURE-PROOF
RECEIVER and DESK STAND CORDS


Durable and flexible conductor braiding of highest quality material, either silk or mercerized cotton.
Each conductor insulated by two wrappings of Tussah silk, applied in reverse directions, and treated with moisture-proof compound.
Seventeen strands of the highest grade copper tinsel form the long-lasting and easily handled conductor.

Runzel-Lenz moisture-proof cords have been in service for more than a score of years and adopted as a recognized standard by many of the leading telephone companies.

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*Specialists in the Making of All Telephone Cords*
1751 N. Western Ave. CHICAGO, ILL.

## Meet A Great New Helper
## The "ALWAYS RELIABLE"
### No. 32 Kerosene-gasoline furnace

**fitted with the improved burner which reduces carbonization to a minimum.**

STARTS IN 2 MINUTES

The new burner is entirely an innovation, and is only one of the new and exclusive features of the new style No. 32 furnace. It will burn for a very long period before it becomes carbonized, and then it is merely necessary to replace clogged pipe with a new one. It produces an intensely hot blue flame, which melts metal and heats soldering irons quickly.

In addition to the burner referred to above, this furnace is fitted with the following improvements:

No. 32 Kerosene-Gasoline Furnace

1. 9¼" heavy sheet steel shield.
2. Heavy steel handle.
3. Patented 1" "Never Leak" pump.
4. Malleable iron arm to hold burner shield. Eliminates the three small nuts.
5. Heavy seamless drawn steel reservoir and bottom having capacity of 1 gallon. Bottom welded into place. The three top bushings brazed into place.
6. Uprights made from heavy steel rod.
7. Burner shield made from heavy steel, and has a slide door so as to enable the user to get at burner.
8. Malleable iron plate brazed to reservoir, which holds uprights. Eliminates three openings in reservoir.
9. Reservoir has funnel. Filler plug has a patented "Dust Proof" cap.
10. Ring welded to bottom reinforces reservoir.

All new features have patents applied for. Write for circular giving additional information on this wonderful furnace. Sample sent on request.

Order through your regular jobber, or mail us your order with the name and address of your regular jobber.

**OTTO BERNZ CO. INC., NEWARK, N. J.**



## Linemen! Switchboard Mechanics! You NEED These

# Vacuum Grip PLIERS

REG. U.S. PAT. OFFICE

You'll save yourself a lot of extra work and worry when these two Vacuum Grip Special patterns are packed in your kit. They take care of jobs that simply can't be done with ordinary pliers.

And remember, Vacuum Grip Pliers are quality tools, built for long service. Hammer-forged from electric furnace tool steel, hardened and tempered thru and thru, NOT CASE HARDENED (surface hardened.)

No. 497—For the hard-to-get-at places. Has 3-in. reach nose, right angle bend, of finest spring tempered steel. Longest reach bent nose pliers made. Length 7". Price $2.25.

No. 197—Heavy duty long needle nose pattern furnished with powerful wire cutter. Fashioned handles, spring tempered. Length 7". Price $2.50.

If your dealer can't supply you send to us direct. We pay parcel post. Write for Catalog T-1 illustrating full line.

***PURCHASING AGENTS: Send for samples for your men to use in running tests.***

**FORGED STEEL PRODUCTS CO.**
**Newport, Penna.**



## *Announcing—* the Highway Earth Boring Machine

### Bores the Hole--Sets the Pole

A pole in the ground every five and one-half minutes is the record recently made on new line construction—under actual operating conditions. A three-man crew with the Highway Earth Boring Machine and Pole Setter bores the holes, sets the poles and moves from position to position all in this remarkable time. A saving of 75% of the time required for the same work by any other method.

The machine mounted on a Fordson or International Harvester tractor, equipped with crawlers, negotiates steep grades and swamps and easily reaches ninety percent of all locations.

***Write for complete information***

**HIGHWAY TRAILER COMPANY**
**EDGERTON, WISCONSIN**

These things temporarily assisted in maintaining interest, but, as the tide ebbs and flows, so group enthusiasm rises and falls.

If we had a "pepometer" or some mechanical device to register the amount of enthusiam and interest being expended in preventing accidents, our work as safety men would be easier, but since no such device exists we must continually evolve new methods of securing continued interest. This continued interest is particularly desirable in the telephone business since a large part of our men are working alone upon the highways and at isolated points, making it imperative that each man be largely his own safety adviser and do his own thinking in averting injury. To accomplish this, we considered instruction in first aid as a suitable vehicle to bring home the necessity of accident prevention.

The practice of applying splints to an imaginary injury affords the man an opportunity to visualize his own arm or leg broken, with perhaps the bone protruding, and is a sobering influence which returns when he is tempted to take a chance on some "short cut."

In the spring of 1921 a number of industries co-operated under the sponsorship of the Detroit Safety Council and conducted several schools: among them a school on fire prevention; a school for foremen; a school for chauffeurs; and a school of first aid to the injured. In the latter were placed a number of our men whom we hoped to develop into instructors capable of training the remainder of our employes. The method of instruction was to have lectures by physicians upon various phases of first aid, followed by class practice in various problems. During the period of practice work, the efforts to excel in the execution of bandage and splint work created a friendly rivalry which stimulated interest and helped materially in developing a knowledge of the subject. The general results were very satisfactory. In addition, we profited through the experience gained and found that demonstration work was the feature that appealed to our men.

In the fall we started our first drive to make every plant man in Detroit the holder of a First Aid Certificate, and the instruction of 1,100 men was no small task. The men instructors were drawn from those who had taken the course the previous spring, but to adapt the instruction to our particular needs, it was found desirable to give additional training. To secure a uniformity of instruction, it was decided to drill this group in the execution of specific problems composed of imaginary injuries which might occur in their own class of work.

We were fortunate in having in our organization a man who had been a scoutmaster and had had several years' experience in drilling competitive teams of Scouts in first aid work. Placed in the position of chief instructor, with a class of selected men, he communicated his enthusiasm to them and was able to create a sufficient amount of curiosity upon the subject to impel them to seek additional information from the text book.

### Start With Knots

There is one feature of this work which may be of particular interest, as it illustrates how careful planning of the job assists its execution. Many of our outside men use various knots in their work and a problem which made use of a complicated knot was put first in the initial lesson. This was best accomplished by raising a question about an installer or other employe who, while working alone, might sustain a sprained ankle. What could he do for himself in getting assistance? This was familiar ground. All knew the possibility and the discomfort of a sprained ankle and the exhibition of the ankle bandage, which is merely a complicated knot, awakened interest and a desire to learn its use.

When each man was invited to try it and failed, his pride in tying knots was challenged. By the time he mastered it his attention had been secured, and a demonstration of the balance of the bandage ties made him eager to master them also. So the general first aid instruction in the Michigan Bell Telephone plant department was begun, and today over 95 per cent of our plant force, some 3,500, are qualified first aid men.

These men are scattered over our territory, qualified and ready to render service to the public, not only in telephone work but in saving life and relieving pain. The public has profited in many emergencies by the prompt application of first aid measures.

In one instance in lower Michigan a child had fallen into the river and after considerable time was drawn from the water and lay apparently lifeless on the bank. Attracted by the throng which gathered, one of our repairmen went over to the scene of the accident. By the application of artificial respiration he was at last rewarded by a convulsive gasp and continued to assist until normal respiration had been restored. The gratitude of the parents of this child, which they had thought dead, is beyond the possibilities of word description. The satisfaction to our employe in saving this child's life, and to his company which gave him the knowledge to perform the deed, should be an inspiration to every man here engaged on accident prevention and first aid work.

Instances of this kind have gradually spread the knowledge of our interest in first aid until the public has come to recognize preparedness of our employes to render this service. An interesting example is seen in the response of an applicant for employment, interviewed by one of our superintendents, who answered the question, "Have you ever had any experience in telephone work," by saying, "No; but I have got something which I understand you people demand." And he explained that he had had a course in first aid in the Boy Scouts and later in a naval training school.

## Central West Takes on More Properties

Jefferson City, Mo.—Public Service Commission has authorized the Central West Telephone Co., to take over the telephone utilities at the following North Missouri towns: Atlanta, Callao, Canton, La Grange, Lewistown, Ewing, Monticello, Maywood, Williamstown, Durham, St. Patrick, Clarence, Lentner, Downing, Frankford, Hunnewell, Linneus, Meadville, Browning, Palmyra, Shelbina, Shelbyville, Center and Edina from E. C. Hunt and the Northeast Missouri Telephone Co.

The purchase price for these plants is $382,970.

Public Utility Financing

P. W. CHAPMAN & CO., INC

170 W. Monroe St. Chicago
42 Cedar Street New York

Boston Albany St. Louis Milwaukee Grand Rapids
New Orleans Seattle Portland San Francisco

# TWISTED PAIR DROP WIRE

"COPPERWELD"

PRODUCTS INCLUDE

**"Ecco Brand" Insulated Twisted Pair Drop Wire**

**Telephone Line Wire**

**Ground Rods**

**Messenger and Guy Wires**
**Cable Rings—Nails**

There is no other "copper-covered steel" or "copper-clad steel" made like "COPPERWELD"—by the Molten Welding Process.

**It takes more than just wire, rubber and cotton to make a quality drop wire.**

There are three features that make genuine Copperweld Drop Wire the standard of quality—Experience, Good Materials and Careful Workmanship.

## Genuine "COPPERWELD" Drop Wire

TRADE MARK REG. U.S. PAT. OFF.

was designed by a telephone engineer of twenty years' experience in the field.

The conductor is genuine Copperweld wire made by the Molten Welding Process.

The rubber insulation is compounded with the greatest of care and is of the very best materials.

The braid is of strong long fibre cotton yarn—closely woven. The saturating and finishing waxes are of the so-called A. T. & T. standard—high melting point and durable. Proper twisting of the pair insures uniform strain on both wires, and maintains a uniform twist throughout its life.

Testing is thorough, and only coils which meet all the specification requirements are shipped.

The result is—a guaranteed standard quality product. No other drop wire has such a guarantee.

Quality is the reason. Service is the answer.

**Insist on genuine Copperweld**

**Copperweld Steel Company**

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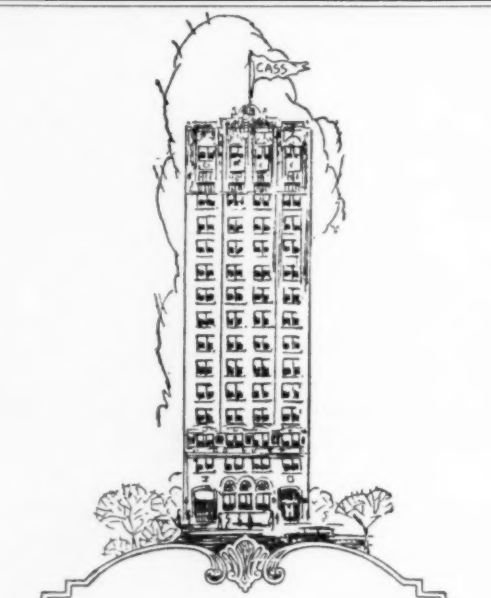
**Also Distributed to Telephone Trade by** *American Electric Company* CHICAGO, ILLINOIS




**Hotel Cass**

**644 CASS CHICAGO**

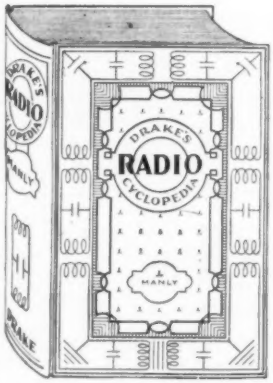
**Rates—$2.25 & Up**

**210 Outside Rooms with Bath**

**H. G. PHILLIPS, Manager**

## Radio's Complete Manual

# DRAKE'S RADIO CYCLOPEDIA




This practical classic on radio contains 871 pages of profusely illustrated material answering every practical radio question from A battery to Zero beat.

Construction, repair, testing, installation, care and operation of radio receivers and power units are handled in a most thorough and useful manner. It is the most complete radio book in print. Price, $6.

**TELEPHONE ENGINEER**

**236 North Clark Street**

**CHICAGO, ILL.**

## CONVENTION CALENDAR

**ARKANSAS TELEPHONE ASSOCIATION**
Little Rock, Hotel Marion
January 16 and 17.

**NEBRASKA TELEPHONE ASSOCIATION**
Kearney, Ft. Kearney Hotel
January 17, 18 and 19.

**MINNESOTA TELEPHONE ASSOCIATION**
Minneapolis, Radisson Hotel
January 24, 25 and 26.

**NORTH DAKOTA TELEPHONE ASSOCIATION**
March 6, 7 and 8.

**OKLAHOMA UTILITIES ASSOCIATION**
Tulsa, Mayo Hotel
March 13, 14 and 15.

**TEXAS INDEPENDENT TELEPHONE ASSOCIATION**
Fort Worth, Texas Hotel
March 20, 21, 22 and 23

**OHIO INDEPENDENT TELEPHONE ASSOCIATION**
Columbus, Deshler-Wallick Hotel
April 11, 12 and 13.

## Freeport's Program Service

(Continued from page 25.)

taining a loud speaker and the pick-up device. This consists of a detector and two-stage amplifier, using alternating current tubes and a "B" supply device. Four connections are required; two for supplying the set with 110 volts, 60 cycles current; one to one side of the telephone circuit and one connected to ground. The connection to the telephone circuit is through less than 100-micro-microfarads capacity, so that losses to the telephone circuit are negligible.

In operating the set there is an off and on switch for turning on the set, three push buttons for selecting one of the three programs, and a volume control. The energy is supplied at such a level that it is possible to secure any volume which might be desired by the subscribers.

BRIDGING twisted pair to twisted pair, a practical application of the Kearney Solderless Service Connector.

FOR Telephone Lines in making party line taps, order Catalog No. 86. The tap can't slacken off. This connector is for No. 12 wire or smaller.



Unassembled Connector

Kearney Guy Wire Serving Clips. Eliminate Serving End of Strand. Made of Aluminum, Copper and Galvanized Iron.

ASK ABOUT KEARNEY CERTIFIED MALLEABLE SCREW TYPE ANCHORS

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

4226M Clayton Ave.


## Chicago Goes on Rotation Billing

Chicago, Ill.—Rotation billing will be put into effect in Chicago during January and February by the Illinois Bell Telo. Co., according to announcement made by B. R. Cooper, commercial manager. In starting the new plan it will be necessary for the company to send two bills during January to some subscribers as the transition to the new plan must be accomplished gradually. After the transition has been completed all bills will cover one month and will be divided into six groups, dated the first, sixth, eleventh, sixteenth, twenty-first and twenty-sixth of the month.

The new plan applies only to subscribers whose calls are metered at the central offices. It does not apply to coin box service.

It has been in successful operation in the state outside of Chicago for some time

# California Independents Inspect Santa Monica Operations

**By ERNEST IRWIN**

*Secretary California Independent Telephone Association*

Santa Monica, Cal.—Santa Monica's meeting of the California Independent Telephone Association was well attended and was a real "get together" for the telephone men of the Independent branch of the industry. Noteworthy was the fact that the San Joaquin Valley was so well represented. The credit for greatest distance traveled to get to the meeting goes to Wm. Hanisch, manager of the Roseville Tel. Co., although A. Terkel, of the Reedley Tel. Co., was only a few miles behind, and Charlie Forbes of Manteca gets honorable mention on the list. The other San Joaquin Valley representatives were H. F. Knapp, Sanger Tel. Co.; J. D. Magill, Fowler Independent Tel. Co.; "Billy D" De Carteret, from Exeter, with Mrs. DeCarteret, and Ed Cookingham, from Lindsay. The majority of the companies south of the Tehechapi were well represented.

At ten o'clock the gang began to assemble, and while the directors of the association held a short session in the private office of General Manager Mason in the Telephone building, a number of small groups of telephone men from all branches of the various organizations went through the Telephone building on tours of inspection. The Santa Monica Bay Telephone Company completed a new building just about one year ago, moving its commercial department over from the old building at that time. The moving of the equipment, however, was not so easily done.

The old telephone building and the new telephone buildings are on adjoining streets, back to back to each other, separated by an alley. Across this alley, on the level of the second floor of each building, was built a temporary bridge, connecting the old and the new switchrooms. And across this bridge, during the last year, the automatic equipment of the Ocean Park exchange has been moved into its new quarters.

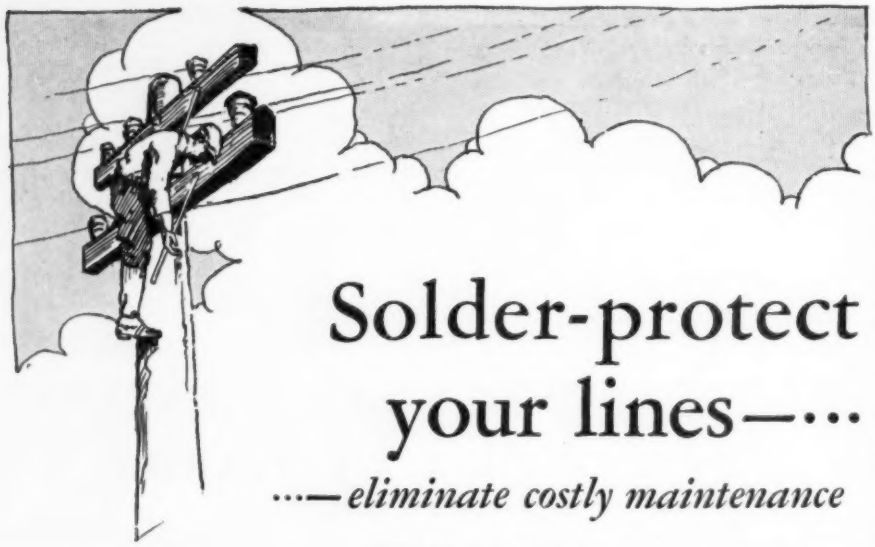
After the inspection of the building had been completed, the automobiles were requisitioned and the entire crowd went down to a vacant lot near the beach, where the Santa Monica company had its pole hole digging machine and its setting machine. Here the digging of holes was demonstrated. The ground was very hard, and even the machine made slow progress, the digging of a hole five feet, six inches deep taking twelve minutes. This place had been chosen especially on account of the hard digging, and some of the construction men present estimated that the digging of such a hole by the use of hand tools would take ordinarily a half day of a man's time.

After the hole was dug, the pole setting tractor squared itself away, picked up a forty-foot pole from the nearby trailer, raised it to a vertical position, moved it around a little to show how easily the poles are handled, and dropped the pole into the hole. Not much more time taken than it takes to tell it. Now pole setting machinery is not a new thing, but this equipment is of a much lighter construction than that usually seen.

Again the party journeyed. This time to the Edgewater Club, where tables were found set for lunch in one of the private dining rooms on the sixth floor.

Mr. Rolfe then called upon Mr. Mason to introduce Ray Nettleship, of the Nettleship Insurance Company of Los Angeles, who gave an interesting talk on the matter of insurance of all kinds as applied to telephone properties.

We are all familiar with fire insurance. In fact we may even think that we have our property well protected from loss in that direction. But, said Mr. Nettleship, in case of a fire even though our buildings and contents were fully insured, so that we recovered their entire loss, would that amount cover the entire loss which we would sustain? No, for there would be that loss sustained through the loss of income by reason of the suspension of



# Solder-protect your lines—···

## ···—*eliminate costly maintenance*

**KESTER**
***Acid Core* SOLDER**

For all iron lines use Kester Acid Core Solder. The scientific flux in Kester is less corrosive than the alleged non-corrosive pastes now on the market. It is much cleaner and far more active. Packed on one, five, ten and twenty pound spools, and one pound coils in cartons. Standard gauge No. 3 about ¼ inch in diameter. (Can be furnished in several alloys and many gauges.)

**KESTER**
***Rosin Core* SOLDER**

For all switchboard and inside work use Kester Rosin Core Solder. Absolutely non-corrosive, pure rosin flux inside this genuine solder makes it safe, simple and sure on any delicate job. Packed on one, five, ten and twenty pound spools, and eighteen inch lengths in five pound boxes. Standard gauge No. 5 about 3-32 inch in diameter. (Can be furnished in several alloys and many gauges.)

***Samples upon request***

EVERY joint in a telephone system is a potential trouble maker unless it is *solder-protected*. The time spent in finding these high-resistance joints on intermittently open and closed circuits causes the unnecessary expense that cuts too deeply into the net profits.

Line splices and sleeve connections—unprotected by solder are an outstanding example. Mechanical joints, which at the start may prove satisfactory enough, will have but a short life before trouble starts.

Subjected to all outdoor conditions, the splices or sleeves are constantly affected by temperature changes causing expansion and contraction—the joint loosens. Smoke, water and ice get in their share of the damage—swaying with the wind, vibration from numerous sources finally conquer every mechanical joint. Then costly trouble-shooting commences—the offending joint is finally found after perhaps hours and even days and months of hunting. As a means of repair, the joint is promptly "bridged"—and if unprotected by solder there are two sources of further trouble. No wonder telephone officials bemoan the high cost of maintenance—···

**Solder-protect your lines, new or old—eliminate unnecessary maintenance**

Kester Acid-Core wire solder on each outside connection makes any mechanical joint electrically secure. A splice can be soldered with Kester in less time than it takes to apply sleeves or bridges, and at a fraction of the cost. Kester with its self-fluxing feature cuts ordinary soldering time one-third—it is easy to use. Underwriters Laboratories examined.

***For sale by* ALL *telephone supply houses***

# KESTER SOLDER

*Self-Fluxing*

Manufactured by

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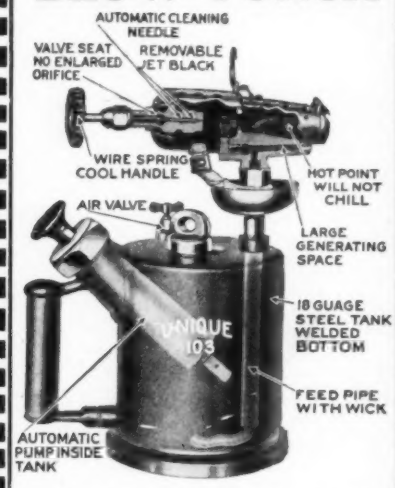
ORIGINATORS AND WORLD'S LARGEST MANUFACTURERS OF SELF-FLUXING SOLDER

# UNIQUE BLOW TORCH




It starts quickly, operates in any position, and produces a remarkable heat. It is a great worker in cold and windy weather.

The automatic orifice cleaner, one of the details shown in the illustration, is but one of a number of exclusive features that make the Unique your greatest value in blow torches.

Painstaking care by interested workmen, an actual "burning test" before shipping, is just another detail responsible for their uniformity and efficient burning qualities.

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221 Whiting St. CHICAGO, ILL.

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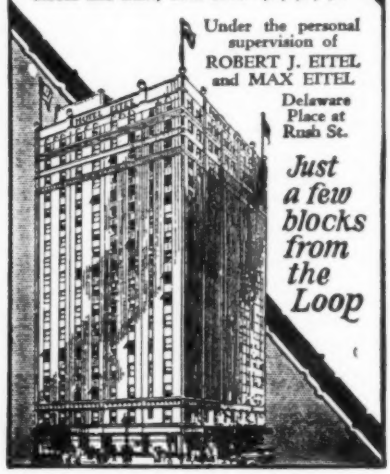
***The Next Time You Come*** to Chicago make your visit a splendid success by stopping at this beautiful new hostelry.

Room and Bath, 1 person —$3.50, $4, $4.50, $5
Each additional person, only $1
Room and Bath, twin beds—$6, $7, $8



Under the personal supervision of ROBERT J. EITEL and MAX EITEL

Delaware Place at Rush St.

***Just a few blocks from the Loop***

operations; there would be a loss to our stockholders through the loss of dividends on their investment; there would be taxes and other expenses which would go on, and perhaps there might be employes, or a complete organization of employes who would have to be paid because the building up of the organization represented an investment, a going-concern value, which would be lost if the employes were to be laid off even temporarily.

Now this kind of a loss is insurable by a kind of insurance called "profits, use and occupancy" insurance. Again another kind of insurance is theft, robbery or hold-up insurance, which protects against risks of the kind mentioned.

Probably the greatest risk carried by telephone utilities is that covered by public liability insurance. We have brought this to the attention of a number of our members of late, asking them to consider in what shape they would be in if a pole was to fall and kill or seriously injure some passer-by. Of if a bus, with a number of occupants should run into some obstruction and injure a number of people we might mortgage our prospects for many years to come.

Mr. Nettleship said that a specialized handling of the insurance problem was necessary in such a specialized business as the telephone business, and he illustrated what he meant by citing the manner in which fire insurance is usually written by the ordinary agent. Telephone properties, he said, are frequently classed as "mercantile business" and insured accordingly. But the insurance policy doesn't fit any better than a store building makes an ideal telephone office.

In reply to the question as to how we may buy insurance economically and intelligently—meaning how we can get what we want and nothing that is not of use, and how we can know that we are getting what we want—the association by motion duly made and carried asked Mr. Nettleship to confer with the secretary on the matter of a survey of the requirements of member companies, and to report as to what arrangements may be best suited for individual needs. A vote of thanks was extended to Mr. Nettleship for the message he had brought to the meeting.

Three new members were accepted—Roseville Tel. Co., Fowler Independent Tel. Co. and the Pine Knot Co. Short reports on various subjects were made by several present. Mr. Mendeck and Mr. Irwin told of some of the happenings at the Chicago convention in October, particularly with reference to the interesting developments in telephone as demonstrated by S. P. Grace, and the secretary told of recent general orders of the railroad commission.

Mr. Wardman invited the association to hold its next meeting in the south at his new residence at Whittier as his guests.

### Greet MacKinnon

California Independent telephone men enjoyed another well attended meeting during the month when F. B. MacKinnon, president of the U. S. Independent Telephone association was their guest of honor at the Jonathan club, Los Angeles, Dec. 17.

After the luncheon the Independent president spoke on the present satisfying Independent status, referring particularly to the ebbing hysteria of mergers. He stated that during the past year the only four of the Class A companies changed hands, 17 of Class B, 22 of Class C, and the rest of the sales and mergers were of the Class D companies. He pointed out the fallacy of some of the mergers and exposed the financing shortcomings of the glaring wild-cat promotions.

A. Wardman, in responding to the MacKinnon address, paid tribute to N. R. Powley, Pacific T. and T. general manager for Southern California and the Pacific's general commercial agent in the territory, Jack Adams for the harmony and co-operation existing between the Independent and Bell interests in that section of the country.

President Rolfe of the California association presented Mr. MacKinnon with the orangewood gavel used during the meeting as a memento of the occasion.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| Automatic Elec. Co. Straight line Common battery Black finish Wood desk set signal sets, with Booster Ind. Coil Ckt. Wired to work with either Western Elec., Kellogg or Stromberg Common battery desk sets @ | $ 2.50 |
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| Gray No. 11 3-slot wall type Paystations for 5, 10 and 25c coins @ | 5.75 |
| Stromberg No. 11 or No. 14 Common battery Booster Ind. coils @ | .35 |
| Kellogg No. 97 Common battery desk set complete with No. 75 Straight line steel signal sets @ | 7.50 |
| Stromberg No. 992 type desk set with New Rebuilt 4-bar, 1000, 1600 or 2500 ohm signal set with latest inside wiring @ $9.50—5-bar @ | 10.00 |
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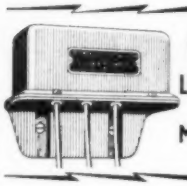
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Addressograph
CHEAPER than typewriter—SAVES 20% of YOUR present costs—5 to 15 times FASTER and BETTER than pen or typewriter.
FREE TRIAL will prove it.
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Fir—Yellow Pine
Plain or Treated
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All cross arms manufactured and shipped from Baltimore, Md.
GULF CROSS ARM CO.,
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DEPENDABLE
NORTHERN WHITE CEDAR POLES
Manufactured as you'd like to have them—
STOCKY and STRAIGHT
Treated or Plain
MICHIGAN POLE & TIE CO.
NEWBERRY, MICH.
SALES: Grand Rapids, Mich.
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J. K. Johnston, Telephone Engineer
During recent years I have been privileged to appraise Telephone Exchanges all over the United States. The list totals 520. Would you like to avail yourself of my services?
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Quick Delivery
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### Four Wheel Drive Makes Pole Derricks

Clintonville, Wis.—The Four-Wheel Drive Auto Co. now is making Graybar pole derricks.

These derricks are essentially tripods made of heat-treated steel pipe for use on two to five-ton trucks which are equipped with power winches, and when used in conjunction with the truck winches are suitable for erecting telephone poles, pulling poles out of the ground, taking them down and for moving poles with or without lines attached, and for loading and unloading trucks and trailers.

There are two general types of derricks. One is made to operate at the middle of the rear end of the truck and is known as the "middle type" and the other operates at the right rear corner of the truck and is known as the "corner type" derrick. The middle type which is used when the truck is not equipped with a boring machine or when the truck has plenty of room for maneuvering, is standard equipment with the Bell Telephone System. The corner type is used on earth boring machine equipped trucks and where the work is largely city work which does not permit the truck to be spotted easily in any location; the corner type permits locating the derrick over the pole hole without swinging the truck.

Kansas City, Mo.—Fred M. Lantz, formerly manager of the Farmers Mutual Telo Co., Clarinda, Ia., now is general manager of the Midwest Telo Co., supervising operations of the Midwest's 33 exchanges in Missouri.

**POSITION WANTED**—in telephone maintenance work. Several years' experience. Formerly in charge of Quantico, Va., marine corps plant and now since honorable discharge from marine corps want employment with telephone company where ability and character will make a good position. Aaron H. Scharlach, 356 S. Homan Ave., Chicago, Ill.

Note Protection at Corners

**Blake Insulated Staples**

Unequalled for telephone and bell wiring. The fiber insulation prevents troublesome short circuits and grounds. 4 sizes. Pat. Nov., 1909. Write for samples.

**Blake Signal & Mfg. Co.**
BOSTON, MASS.

**The "STEWART" Direct Reading Test Cabinet**

Measures shorts, crosses and ground direct in ohms. Resistance to trouble is read off the scale the same as volts off a voltmeter.

Any telephone man can install it and use it. Will save many times its cost in a year.

It costs more to do without the Test Cabinet than to buy one. Write for circular. Sent on trial.

**Also, Test Sets, Cable Testers and Detecto-Meters.**

**STEWART BROTHERS**
OTTAWA, ILLINOIS

**"REBUILT" TELEPHONE APPARATUS** and exchange equipment saves you 30 to 50 per cent without sacrificing quality or efficiency.

**SWITCHBOARDS**—Telephones—Apparatus—Protection Equipment—Cable—Everything you need for the installation and operation of a complete exchange—Magneto or Central Energy—of the best and most reputable manufacturers.

**Fourteen years' successful operation** of our rebuilt equipment department puts it past the experimental stage. Quality and price will make you a permanent customer. Better investigate.

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are guaranteed as to dependability, durability and operating economy by a long and successful service record. They represent the greatest advancement in telephone cable manufacture.

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Specialists in Appraisals, Rate Surveys, Financial Investigations, Organization and Operation of Telephone Companies
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Always shows you where you stand. We have solved the bookkeeping problems of a large number of companies.
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Specialization on Public Utility Accounting Records and Audits enables us to best serve Telephone Companies.
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